



WTU-14

User's Manual

version 1.11

Phonetics, Inc.

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First Edition, version 1.11, January 2005

Written and produced by Phonetics, Inc.

Please address comments on this publication to:

Phonetics, Inc.
901 Tryens Road
Aston, PA 19014

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Important Safety Instructions

Your Skymetry WTU-14 has been carefully designed to give you years of safe, reliable performance. As with all electrical equipment, however, there are a few basic precautions you should take to avoid hurting yourself or damaging the unit:

- Read the installation and operating instructions in this manual carefully. Be sure to save it for future reference.
- Read and follow all warning and instruction labels on the product itself.
- To protect the Skymetry WTU-14 from overheating, make sure all openings on the unit are not blocked. Do not place on or near a heat source, such as a radiator or heat register.
- Do not use your Skymetry WTU-14 near water, or spill liquid of any kind into it.
- Be certain that your power source matches the rating listed on the AC power transformer. If you're not sure of the type of power supply to your facility, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- Do not overload wall outlets and extension cords, as this can result in the risk of fire or electric shock.
- Never push objects of any kind into this product through ventilation holes as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock.
- To reduce the risk of electric shock, do not disassemble this product, but return it to Sensaphone Customer Service or another approved repair facility when any service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the unit is subsequently used.
- If anything happens that indicates that your Skymetry WTU-14 is not working properly or has been damaged, unplug it immediately and follow the procedures in the manual for having it serviced. Return the unit for servicing under the following conditions:
 1. The power cord or plug is frayed or damaged.
 2. Liquid has been spilled into the product or it has been exposed to water.
 3. The unit has been dropped, or the enclosure is damaged.
 4. The unit doesn't function normally when you're following the operating instructions.

CAUTION: To reduce the risk of fire or injury to persons, read and follow these instructions:

1. Replace the battery only with the same or equivalent type recommended by the manufacturer.
2. Do not dispose of the battery in a fire. The cell may explode. Check with local codes for possible special disposal instructions.
3. Do not open or mutilate the battery. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.
4. Exercise care in handling battery in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.

FCC Requirements

Part 15: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

If you experience trouble with the Skymetry WTU-14, or you need information on obtaining service or repairs, please contact:

Phonetics, Inc.

901 Tryens Road

Aston, PA 19014

Phone: 610.558.2700

FAX: 610.558.0222

3 YEAR LIMITED WARRANTY

PLEASE READ THIS WARRANTY CAREFULLY BEFORE USING THE PRODUCT.

THIS LIMITED WARRANTY CONTAINS SENSAPHONE'S STANDARD TERMS AND CONDITIONS. WHERE PERMITTED BY THE APPLICABLE LAW, BY KEEPING YOUR SENSAPHONE PRODUCT BEYOND THIRTY (30) DAYS AFTER THE DATE OF DELIVERY, YOU FULLY ACCEPT THE TERMS AND CONDITIONS SET FORTH IN THIS LIMITED WARRANTY.

IN ADDITION, WHERE PERMITTED BY THE APPLICABLE LAW, YOUR INSTALLATION AND/OR USE OF THE PRODUCT CONSTITUTES FULL ACCEPTANCE OF THE TERMS AND CONDITIONS OF THIS LIMITED WARRANTY (HEREINAFTER REFERRED TO AS "LIMITED WARRANTY OR WARRANTY"). IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS OF THIS WARRANTY, INCLUDING ANY LIMITATIONS OF WARRANTY, INDEMNIFICATION TERMS OR LIMITATION OF LIABILITY, THEN YOU SHOULD NOT USE THE PRODUCT AND SHOULD RETURN IT TO THE SELLER FOR A REFUND OF THE PURCHASE PRICE. THE LAW MAY VARY BY JURISDICTION AS TO THE APPLICABILITY OF YOUR INSTALLATION OR USE ACTUALLY CONSTITUTING ACCEPTANCE OF THE TERMS AND CONDITIONS HEREIN AND AS TO THE APPLICABILITY OF ANY LIMITATION OF WARRANTY, INDEMNIFICATION TERMS OR LIMITATIONS OF LIABILITY.

1. **WARRANTOR:** In this Warranty, Warrantor shall mean "Dealer, Distributor, and/or Manufacturer."

2. **ELEMENTS OF WARRANTY:** This Product is warranted to be free from defects in materials and craftsmanship with only the limitations and exclusions set out below.

3. **WARRANTY AND REMEDY:** Three-Year Warranty — In the event that the Product does not conform to this warranty at any time during the time of three years from original purchase, warrantor will repair the defect and return it to you at no charge.

This warranty shall terminate and be of no further effect at the time the product is: (1) damaged by extraneous cause such as fire, water, lightning, etc. or not maintained as reasonable and necessary; or (2) modified; or (3) improperly installed; or (4) misused; or (5) repaired or serviced by someone other than Warrantors' authorized personnel or someone expressly authorized by Warrantor's to make such service or repairs; (6) used in a manner or purpose for which the product was not intended; or (7) sold by original purchaser.

LIMITED WARRANTY, LIMITATION OF DAMAGES AND DISCLAIMER OF LIABILITY FOR DAMAGES:

THE WARRANTOR'S OBLIGATION UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AT THE WARRANTOR'S OPTION AS TO REPAIR OR REPLACEMENT. IN NO EVENT SHALL WARRANTORS BE LIABLE OR RESPONSIBLE FOR PAYMENT OF ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL AND/OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO ANY LABOR COSTS, PRODUCT COSTS, LOST REVENUE, BUSINESS INTERRUPTION LOSSES, LOST PROFITS, LOSS OF BUSINESS, LOSS OF DATA OR INFORMATION, OR FINANCIAL LOSS, FOR CLAIMS OF ANY NATURE, INCLUDING BUT NOT LIMITED TO CLAIMS IN CONTRACT, BREACH OF WARRANTY OR TORT, AND WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE. IN THE EVENT THAT IT IS DETERMINED IN ANY ADJUDICATION THAT THE LIMITED WARRANTIES OF REPAIR OR REPLACEMENT ARE INAPPLICABLE, THEN THE PURCHASER'S SOLE REMEDY SHALL BE PAYMENT TO THE PURCHASER OF THE ORIGINAL COST OF THE PRODUCT, AND IN NO EVENT SHALL WARRANTORS BE LIABLE OR RESPONSIBLE FOR PAYMENT OF ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL AND/OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING

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WITHOUT WAIVING ANY PROVISION IN THIS LIMITED WARRANTY, IF A CIRCUMSTANCE ARISES WHERE WARRANTORS ARE FOUND TO BE LIABLE FOR ANY LOSS OR DAMAGE ARISING OUT OF MISTAKES, NEGLIGENCE, OMISSIONS, INTERRUPTIONS, DELAYS, ERRORS OR DEFECTS IN WARRANTORS' PRODUCTS OR SERVICES, SUCH LIABILITY SHALL NOT EXCEED THE TOTAL AMOUNT PAID BY THE CUSTOMER FOR WARRANTORS' PRODUCT AND SERVICES OR \$250.00, WHICHEVER IS GREATER. YOU HEREBY RELEASE WARRANTORS FROM ANY AND ALL OBLIGATIONS, LIABILITIES AND CLAIMS IN EXCESS OF THIS LIMITATION.

INDEMNIFICATION AND COVENANT NOT TO SUE: YOU WILL INDEMNIFY, DEFEND AND HOLD HARMLESS WARRANTORS, THEIR OWNERS, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS, SUPPLIERS OR AFFILIATED COMPANIES, AGAINST ANY AND ALL CLAIMS, DEMANDS OR ACTIONS BASED UPON ANY LOSSES, LIABILITIES, DAMAGES OR COSTS, INCLUDING BUT NOT LIMITED TO DAMAGES THAT ARE DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, AND INCLUDING ATTORNEYS FEES AND LEGAL COSTS, THAT MAY RESULT FROM THE INSTALLATION, OPERATION, USE OF, OR INABILITY TO USE WARRANTORS' PRODUCTS AND SERVICES, OR FROM THE FAILURE OF THE WARRANTORS' SYSTEM TO REPORT A GIVEN EVENT OR CONDITION, WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE.

YOU AGREE TO RELEASE, WAIVE, DISCHARGE AND COVENANT NOT TO SUE WARRANTORS, THEIR OWNERS, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS, SUPPLIERS OR AFFILIATED COMPANIES, FOR ANY AND ALL LIABILITIES POTENTIALLY ARISING FROM ANY CLAIM, DEMAND OR ACTION BASED UPON ANY LOSSES, LIABILITIES, DAMAGES OR COSTS, INCLUDING BUT NOT LIMITED TO DAMAGES THAT ARE DIRECT OR INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, AND INCLUDING ATTORNEYS FEES AND LEGAL COSTS, THAT MAY RESULT FROM THE INSTALLATION, OPERATION, USE OF, OR INABILITY TO USE WARRANTORS' PRODUCTS AND SERVICES, OR FROM THE FAILURE OF THE WARRANTORS' SYSTEM TO REPORT A GIVEN EVENT OR CONDITION, WHETHER OR NOT CAUSED BY WARRANTORS' NEGLIGENCE, EXCEPT AS NECESSARY TO ENFORCE THE EXPRESS TERMS OF THIS LIMITED WARRANTY.

EXCLUSIVE WARRANTY: THE LIMITED WARRANTY OR WARRANTIES DESCRIBED HEREIN CONSTITUTE THE SOLE WARRANTY OR WARRANTIES TO THE PURCHASER. ALL IMPLIED WARRANTIES ARE EXPRESSLY DISCLAIMED, INCLUDING: THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR USE AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND THE WARRANTY OF NON-INFRINGEMENT AND/OR ANY WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

It must be clear that the Warrantors are not insuring your premises or business or guaranteeing that there will not be damage to your person or property or business if you use this Product. You should maintain insurance coverage sufficient to provide compensation for any loss, damage, or expense that may arise in connection with the use of products or services, even if caused by Warrantors' negligence. The warrantors assume no liability for installation of the Product and/or interruptions of the service due to strikes, riots, floods, fire, and/or any cause beyond Seller's control, further subject to the limitations expressed in any License Agreement or other Agreement provided by Warrantors to purchaser.

The agreement between the Warrantors and the Purchaser, including but not limited to the terms and conditions herein shall not be governed by the Convention for the International Sale of Goods. Where applicable, the Uniform Commercial Code as adopted by the State of Delaware shall apply.

4. PROCEDURE FOR OBTAINING PERFORMANCE OF WARRANTY: In the event that the Product does not conform to this warranty, the Product should be shipped or delivered freight prepaid to a Warrantor with evidence of original purchase.

5. LEGAL REMEDIES AND DISCLAIMER: Some jurisdictions may not allow, or may place limits upon, the exclusion and/or limitation of implied warranties, incidental damages and/or consequential damages for some types of goods or products sold to consumers and/or the use of indemnification terms. Thus, the exclusions, indemnification terms and limitations set out above may not apply, or may be limited in their application, to you. If the implied warranties can not be excluded, and the applicable law permits limiting the duration of implied warranties, then the implied warranties herein are to be limited to the same duration as the applicable written warranty or warranties herein. The warranty or warranties herein may give you specific legal rights that will depend upon the applicable law. You may also have other legal rights depending upon the law in your jurisdiction.

6. CHOICE OF FORUM AND CHOICE OF LAW: In the event that a dispute arises out of or in connection with this Limited Warranty, then any claims or suits of any kind concerning such disputes shall only and exclusively be brought in either the Court of Common Pleas of Delaware County, Pennsylvania or the United States District Court for the Eastern District of Pennsylvania.

Regardless of the place of contracting or performance, this Limited Warranty and all questions relating to its validity, interpretation, performance and enforcement shall be governed by and construed in accordance with the laws of the State of Delaware, without regard to the principles of conflicts of law.

Effective date May 1, 2004
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TABLE OF CONTENTS

Important Safety Instructions	iii
FCC Requirements	iv
WARRANTY	vi
Chapter 1: Introduction	15
Features	16
Skymetry WTU-14 Diagram.	17
Overview	18
Web Page Initialization	18
Data Message Usage	18
Technical Support	19
Chapter 2: Installation	21
Operating Environment	21
Activating your Skymetry WTU-14.	21
Mounting the Skymetry WTU-14 (Aluminum Housing)	21
Mounting the Skymetry WTU-14 (NEMA-4X Housing).	23
Locking the NEMA 4X Enclosure.	24
Antenna Information	25
Connecting the Power Supply	25
Connecting a Battery.	26
Grounding	27
Wiring Sensors to Dry Contact Inputs.	28
Normally Closed Sensors.	29
Normally Open Sensors.	30
Wiring Sensors to Analog Inputs	31
Wiring Recommendations	33
LED Indicators	34

- Chapter 3: Software Installation. 35**
 - Installing and Starting the Software. 35**
 - Installation 35
 - Activating your Skymetry WTU-14. 36**
 - Connecting Locally 36
 - Skymetry WTU-14 Web Page 38**
- Chapter 4: Input Programming 39**
 - Alarm States 39**
 - Dry Contact Inputs. 40**
 - Dry Contact Programming 41**
 - Configuring the Input Name 42
 - Input Enable/Disable. 42
 - Configuring the Input Type 42
 - Configuring the Run Timer 42
 - Configuring the Pulse Counter 42
 - Alarm Enable/Disable 43
 - Alarm on Return-to-Normal 43
 - Alarm Recognition Time 43
 - Alarm Reset Time 43
 - Analog Inputs 43**
 - Analog Inputs Programming 44**
 - Configuring the Input Name 44
 - Configuring the Input Type 45
 - Input Enable/Disable. 45
 - Setting Table Limits 45
 - Calibration. 45
 - Alarm Enable/Disable 45
 - Alarm on Return-to-Normal 46
 - Setting the Alarm Limits 46
 - Alarm Recognition Time 46

Alarm Reset Time	46
Power Input	46
Battery Input	47
Special Function Inputs	47
Chapter 5: Output Programming	49
Setting the Output Name	50
Configuring the Output Operating Mode	50
Switching the Output	51
Output Status & Statistics	51
Chapter 6: Pump Control	53
How it works—Float Switches	53
How it works—Analog Level Sensor	55
Installation Recommendations	55
Programming for Pump Control	55
Output Wiring	57
Chapter 7: Machine-to-Machine Control	59
Local Output Control	60
Important Information and Warnings	61
Sample Application	61
Chapter 8: Alarm Notification	65
How does notification work	65
Voice Phone Call	66
Internet E-Mail	67
Alphanumeric Pager	69
Text Messaging to Cell Phones	71
Acknowledgment via E-mail or Text Message	74
Additional Information	74

Chapter 9: Operation	75
PART ONE: Alarm Notification and Acknowledgment	75
Alarm Recognition	75
Alarm Notification	75
Dialout Note: Call Progress	75
Alarm Notification—Voice	76
Alarm Notification—E-mail	76
Alarm Notification—Alphanumeric Pager	77
Alarm Notification—Text Message to Cell Phone	77
Tier Delay	77
Alarm Acknowledgment	78
Alarm Acknowledgment—Voice Notification	78
Alarm Acknowledgment—Alphanumeric Pager	79
Alarm Acknowledgment—Text Message to Cell Phone	79
Alarm Acknowledgment—Automatic	80
PART TWO: Status Request	81
Chapter 10: Skymetry Web Page	83
Status Refresh	83
Programming Refresh	84
Programming via the Web Page	84
Switching Outputs via the Web page	84
Account Usage	85
Alarm History	85
Chapter 11: Testing the Skymetry WTU-14	87
Notification Testing	87
Input Testing	87
Output Testing	88
Control Programming	88
Pump Control	89

APPENDIX A: Checking Your Skymetry WTU-14 for Proper Operation	91
APPENDIX B: Troubleshooting	93
APPENDIX C: Thermistor Table	99
APPENDIX D: SKYMETRY WTU-14 Specifications .	101
APPENDIX E: Replacing the Backup Battery . . .	103
APPENDIX F: Optional Accessories	105
APPENDIX G: Returning Your Skymetry WTU-14 for Repair	107
Test Log	109
Index	111

Chapter 1: Introduction

Congratulations on your purchase of the Skymetry WTU-14 by Phonetics, Inc.

The WTU-14 Wireless Telemetry Unit is a powerful monitoring, alarm, and control system. Its built-in wireless technology means you won't need a telephone line to communicate with the unit. It can monitor and control your environment and equipment using eight dry contact inputs, six analog inputs, built-in power failure detection, and two relay outputs. It can perform simplex or duplex alternating pump control using a level transducer or float switches. The unit can also perform machine-to-machine control among multiple WTU-14 devices. Up to 8 machine-to-machine control algorithms can be configured per device so that input conditions on one Skymetry WTU-14 can logically control outputs on another using simple, fill-in-the-blank, comparison programming. The unit features several communication options including: voice telephone call, e-mail, and text messaging. You can also request a status report from most two-way text devices, like alphanumeric pagers and cell phones. The Skymetry WTU-14 is fully programmable via the included Skymetry Software package for Windows or through the unit's web page at www.skymetry.com.

The WTU-14 will produce a web page of input and output status and alarm history that can be viewed at **www.skymetry.com**. You can also program the unit or control outputs from the web page. The Skymetry is the ultimate choice for remote monitoring and control where telephone lines are non-existent or too expensive. Applications include pump houses, cable TV huts, remote equipment rooms, and tower light monitoring.

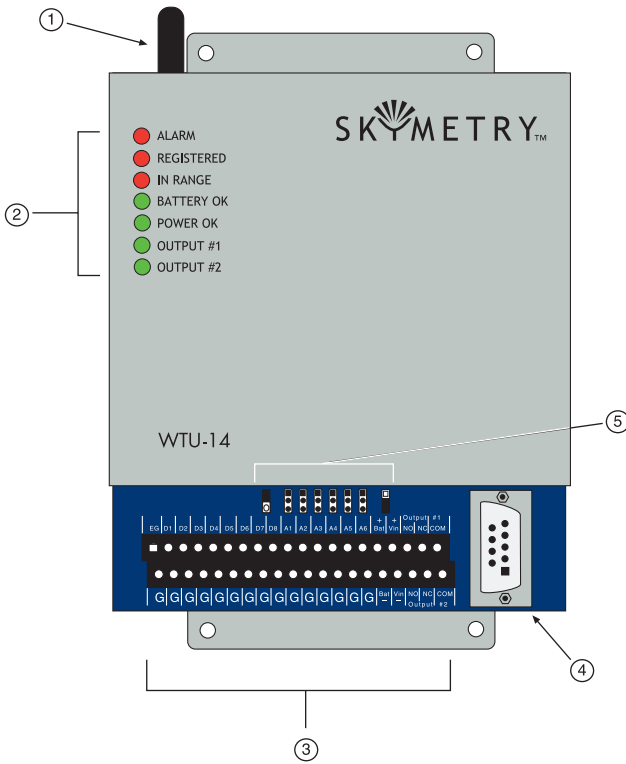
On the front of the unit are LED indicators to show the operating status (Power, Battery OK, In-Range, Registered, Alarm, and Outputs). All programming is stored in nonvolatile memory so that all programming is retained even without power. The unit will perform alarm event logging of the 14 inputs, power, and battery to the Skymetry web page. A complete status report of all monitored con-

ditions can be retrieved via e-mail for viewing on a computer or text messaging device. The Skymetry.com web page can be updated on demand to allow viewing of the current conditions at the site from any internet-connected computer. The unit comes in an aluminum housing with mounting tabs and is optionally available in a plastic NEMA-4X enclosure with a 36-hour battery backup.

Features

- 8 Dry Contact Inputs: NO, NC, Pulse Count, Equipment Run-Time
- 6 Analog Inputs: 10K Thermistor (temperature), or 4–20mA
- 2 Relay Outputs: 20 different automatic and manual modes
- Local Logic Control
- Machine-to-Machine Control among Skymetry units
- Duplex and Simplex Pump Control
- Wireless Alarm Message Delivery via Voice, E-mail, or text message.
- Status & Programming via web page
- NEMA 4X enclosure and Battery Backup (optional)
- Low Power consumption—suitable for solar operation
Solar Kit available (Part No. FGD-0062)

Skymetry WTU-14 Diagram



1. Antenna
2. LEDs
3. Terminal blocks
4. RS-232 DCE
5. Jumpers for Temperature or 4–20mA settings

Overview

When installing and programming a Skymetry WTU-14 there are several steps required for all installations. Listed below are those required for a typical installation and start-up of the Skymetry WTU-14.

- 1) Confirm wireless coverage for the installation site.
- 2) Select a wireless messaging plan and activate the unit.
- 3) Install the unit, set the input jumpers, and wire the sensors.
- 4) Go online locally and program the unit.
- 5) Wait for the web page to initialize and become active.
- 6) Verify status on the web site.
- 7) Test all sensors and alarm notification—see *Chapter 11: Testing the Skymetry WTU-14*

Web Page Initialization

Your Skymetry WTU-14 is accessible via the internet at www.skymetry.com. From the web page you can view status, make programming changes, and even control outputs. Before any of these features can be utilized, the unit must first initialize the web server. This happens automatically immediately after your first local programming session with the unit. As soon as you disconnect from your first programming session the unit will begin to update the web server with all of its programming. This may take an hour or two depending on how many parameters were programmed. During this initialization period it is recommended that the unit remain powered on and no additional programming changes take place. For detailed information on the Skymetry web page see Chapter 10.

Data Message Usage

Your Skymetry WTU-14 communicates over the wireless network using data messages. These are transmitted whenever an alarm message is delivered, machine-to-machine command is sent, or a web update is requested. The number of data messages used for each type of transmission is shown below in the table:

Alarm Message to Voice or E-mail	1–4
Alarm Message to Web Server	1
Alarm Acknowledgement	1
Programming Parameter Read or Write	2
Machine-to-Machine Command	1
Status Refresh to the Web Page	5–7
Programming Refresh to the Web Page	9 to 115

The last item, *Programming Refresh to the web*, depends on how many changes were made since the last update. Only items that have changed will be sent. Typically, once the unit has been programmed, additional programming changes are minimal. However, if you were to completely reprogram the unit and change every parameter, then the maximum number of data messages would be transmitted.

Technical Support

This instruction manual will help you install and program the Skymetry WTU-14 properly. Be sure to read it completely before beginning the installation process. If there are any questions or problems that arise upon installation or operation, please contact our Technical Support team:

PHONETICS, INC.
 901 Tryens Road
 Aston, PA 19014
 Phone: 610.558.2700
 FAX: 610.558.0222
support@sensaphone.com

Chapter 2: Installation

Operating Environment

The Skymetry WTU-14 should be mounted and operated in a clean, dry environment. The unit must communicate to the wireless network, so care must be taken not to install the unit inside a metal cabinet or other location that will prevent the unit from receiving a radio signal unless the antenna can be relocated to a location free of obstruction. The unit is microprocessor-controlled and, as a result, should not be installed near devices that generate strong electromagnetic fields. Such interference is typically generated by power switching equipment such as motors, contactors, or variable frequency drives. Where this is unavoidable, mount the unit in a separate, grounded steel enclosure with an external antenna (see Appendix F: Accessories). A poor operating environment may result in unwanted system resets and/or system lockup. The temperature range the unit can operate in is -20°F to 158°F (-29°C to 70°C).

Activating your Skymetry WTU-14

Your Skymetry device *must* be activated on the wireless network before you can send or receive messages *and* before any local programming is performed for the first time.

To activate your Skymetry WTU-14 device, fill out the activation form included with the package and follow the instructions, or contact your sales representative with the device serial number.

Your Skymetry WTU-14 is activated when the “In Range” and “Registered” LEDs are lit.

Mounting the Skymetry WTU-14 (Aluminum Housing)

Locate a suitable mounting location for the WTU-14 that provides good radio reception and convenient wiring to your equipment and power. If you will be connecting high voltages to the outputs, con-

sider placing the unit inside of a cabinet for safety. Use a plastic or fiberglass cabinet to minimize the signal loss on radio reception. When installing the unit inside of a metal cabinet, be sure to use an external antenna as the metal will shield the unit from receiving a radio signal.

On the top and bottom of the housing are mounting holes to attach the unit to either a panel or wall. The mounting surface should be sturdy enough to support 2 lbs.

The unit should be mounted using four #10-32 bolts where appropriate, or four #10 tapping screws. (The screw kit for the Skymetry WTU-14 includes (4) #10-32 screws, (4) #10-32 nuts, and (4) #10 lockwashers). When mounting the unit to a wall, make sure the mounting screws fully engage a solid member (for example, a stud) of the support structure. Mount the Skymetry WTU-14 in an upright position so that you can easily connect wires to the terminal strips. The dimensions of the enclosure are: 8.0" x 6.1" x 1.6". See Figure 1.

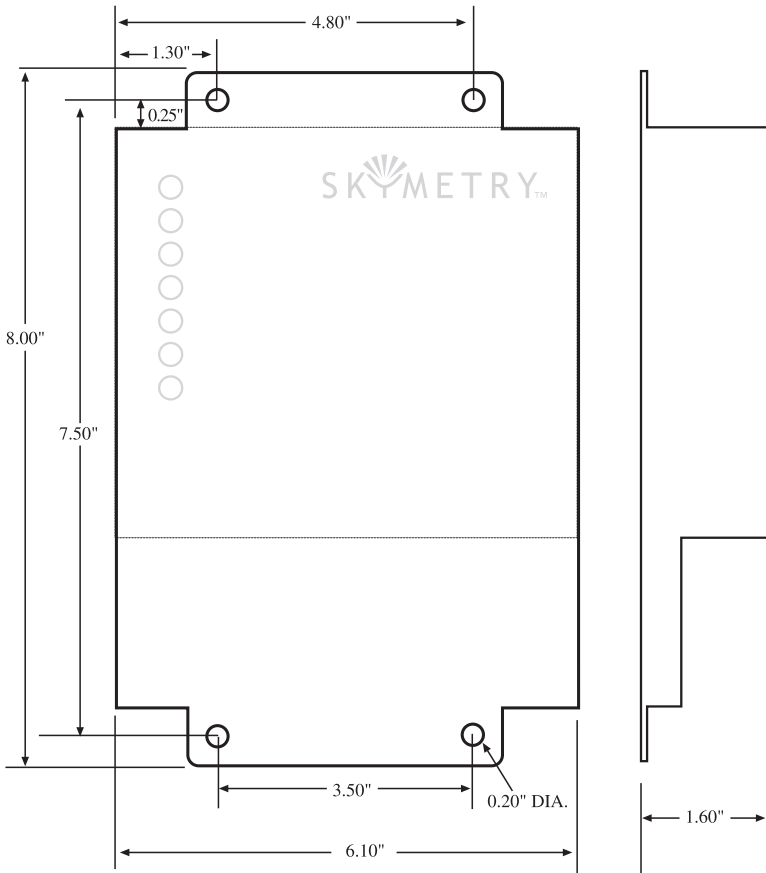


Figure 1: Skymetry mounting

Mounting the Skymetry WTU-14 (NEMA-4X Housing)

Locate a suitable mounting location for the Skymetry WTU-14 enclosure that provides good radio reception and convenient wiring to your equipment and power. On the top and bottom of the housing are mounting tabs to attach the unit to a wall. The mounting surface should be sturdy enough to support 10 lbs. The unit should be mounted using four #10-32 bolts where appropriate, or four #10 tapping screws. (The screw kit for the WTU-14 includes (4) #10-32 screws, (4) #10-32 nuts, and (4) #10 lockwashers). When mounting the unit to a wall, make sure the mounting screws fully engage a

solid member (for example, a stud) of the support structure. Mount the WTU-14 in an upright position so that you can easily connect wires to the terminal strips. The dimensions of the NEMA-4x enclosure are: 12.1" x 8.0" x 5.5". See Figure 2.

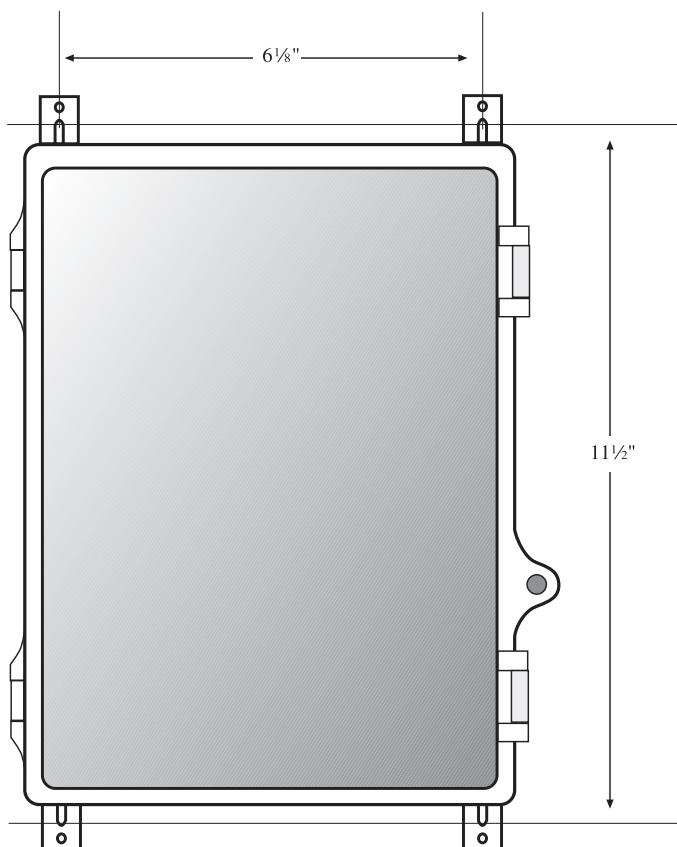


Figure 2: NEMA-4 Mounting diagram

Locking the NEMA 4X Enclosure

The Skymetry WTU-14 enclosure can be locked by installing a small padlock through the loop on the front door of the enclosure. See Figure 3.

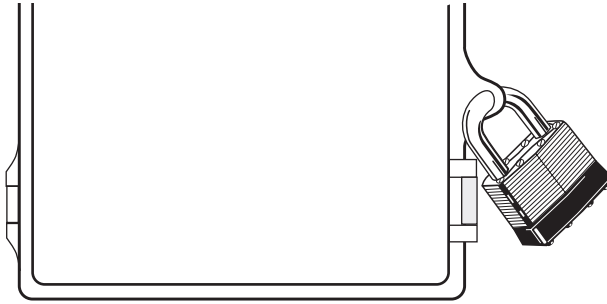


Figure 3: Locking the NEMA-4x enclosure

Antenna Information

The Skymetry WTU-14 comes with a unity-gain stub antenna designed specifically for the frequency range required. In order to comply with FCC RF exposure, the external antenna must be mounted in a location where people will never come within 20cm of the antenna. The gain of the antenna may not exceed 0dBi. For optimum antenna performance, there should be no metal objects within close proximity of the antenna.

WARNING Do not over-tighten the antenna on the Skymetry WTU-14; this may cause *permanent* damage to the device.

The antenna *must* be connected before the device is powered up.

Connecting the Power Supply

The Skymetry WTU-14 requires a 15VDC 800mA power supply (part number FGD-8250) to operate. This power supply will charge an external 12V battery (2–12AH) and provide the necessary power to transmit messages over the wireless network.

WARNING: Do not substitute supplies with lower capacity.

Connect the positive terminal of the Power Supply to the **+Vin** terminal on the Skymetry WTU-14.

Connect the negative terminal of the Power Supply to the **-Vin** terminal on the Skymetry WTU-14.

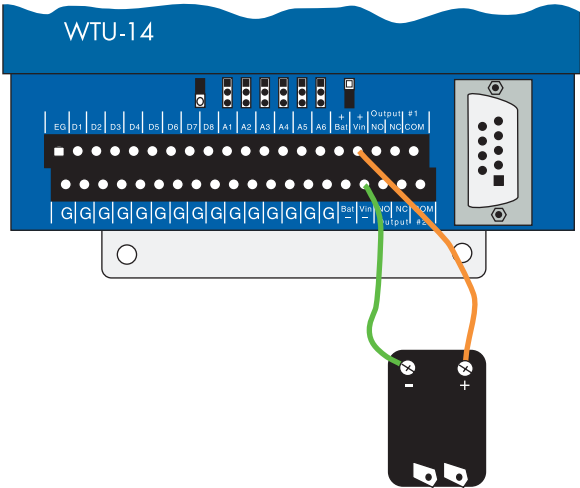


Figure 4: Power Supply Wiring

Connecting a Battery

In the event of a power failure, the Skymetry WTU-14 can operate from a 12V sealed lead-acid gel-cell rechargeable battery. The duration of battery time depends on the capacity of the battery (*see chart below*). The unit incorporates circuitry to maintain the proper charge for a 12V gel-cell battery whenever the power supply is plugged in. The unit also includes special circuitry to prevent the battery from being damaged in the event of an extended power outage. The battery should provide approximately 5 years of service before needing replacement.

Battery Capacity (AH)	Backup Time (hrs)
2.2	36
3.0	50
5.0	80
8.0	120
12.0	200

Connect the positive terminal of the Battery to the + **Bat** terminal on the Skymetry WTU-14.

Connect the negative terminal of the Battery to the – **Bat** terminal on the Skymetry WTU-14.

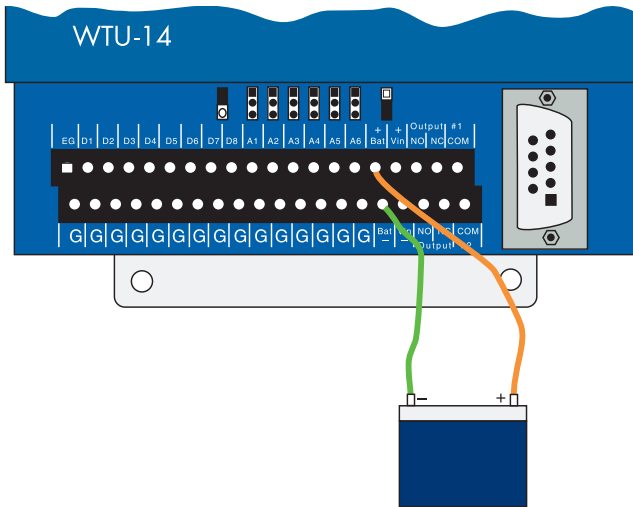


Figure 5: Battery connection

The battery is considered low at 12.0V and the Battery LED will blink at this voltage level. If main power is less than 7.0V and the battery voltage reaches 11V, the battery LED will go out and the unit will go into hibernation mode (a low-power mode in which the unit shuts down). The unit will return to its regular operating mode when either the main power is restored or the battery voltage rises above 11.5V. If the battery voltage continues to fall below 10.5V, the unit will disconnect the battery to prevent deep discharge damage to the battery. The unit will not reconnect the battery until the battery voltage rises above 12.5V.

Grounding

Connect a #14AWG copper wire to the earth ground terminal (marked “EG”) on the left end of the terminal strip and connect the other end to a ground rod or metal cold water pipe (*See Figure 6*). It is extremely important that the earth ground connection be as short as possible. The ground rod should have sufficient depth to provide a low impedance connection to earth. This connection is required for the surge/lightning protection circuits to function properly.

NOTE: Proper earth grounding of the Skymetry WTU-14 is required for warranty coverage.

Ground rods can typically be found at local electrical supply houses and/or hardware stores. You **MUST** contact your state “Call before you dig” hotline at least *two* days before you install your ground rod, to insure that it is safe to install the ground rod in a chosen area.

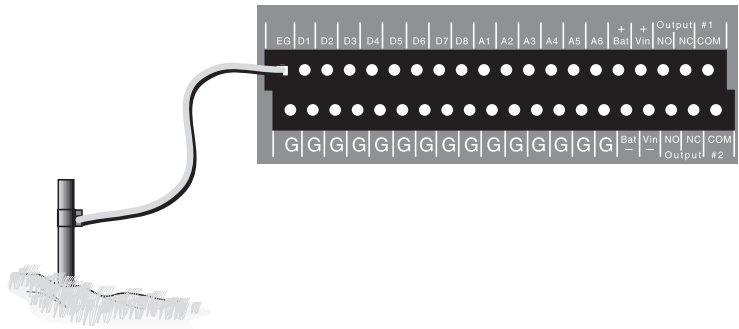


Figure 6: Grounding the Skymetry

Wiring Sensors to Dry Contact Inputs

The WTU-14 has 8 Dry Contact inputs that can be used to monitor Normally Open (N.O.) or Normally Closed (N.C.) sensors. In addition, they can also be used for pulse counting and equipment run-time accumulation. When used for pulse count or run time functions, the unit will count the pulse (or accumulate time) when the input changes to the opposite of its normal state.

Dry contact sensors are wired to the terminals labeled D1 through D8. The corresponding Ground terminals are located on the lower level terminal strip. The input type is programmed within the Skymetry Software.

WARNING: Do not use sensors, switches, or relays that supply any voltage or current to the Skymetry WTU-14.

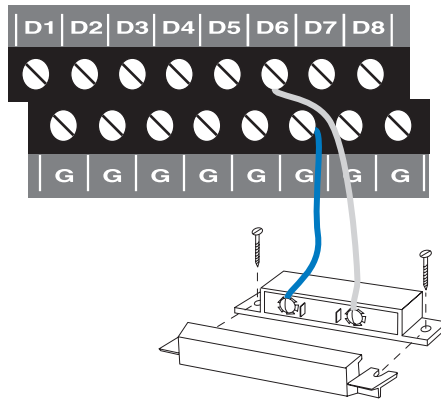


Figure 7: Sensor connected to a dry contact input]

Any N.O. or N.C. sensor can be attached to the WTU-14 using 18–24 gauge wire. For distances of 1000' or more, use heavier gauge wire. When running wire outdoors it is recommended that shielded cable be used. Connect the shield to a good earth ground or metallic cold water pipe. The total resistance of the circuit cannot be greater than 100 ohms. Use wire appropriate for the application. See the wire length recommendations, later in this chapter.

The WTU-14 may have more than one sensor connected to the same terminal, however, the normal condition for each sensor on the same terminal must be identical (either all N.O. or all N.C.).

Normally Closed Sensors

To wire more than one normally closed sensor on one input, they must be connected in series. Connect a lead from the first sensor to one of the Dry Contact Inputs on the terminal strip. Next, take the other lead from the first sensor and connect it to one lead from the next sensor. Continue connecting sensors end-to-end until you have connected all of your sensors. Take the second lead from your last sensor and connect it to the ground screw on the WTU-14 terminal strip. See Figure 8.

Multiple N.C. inputs are typically magnetic reed switches to monitor the security of windows and doors.

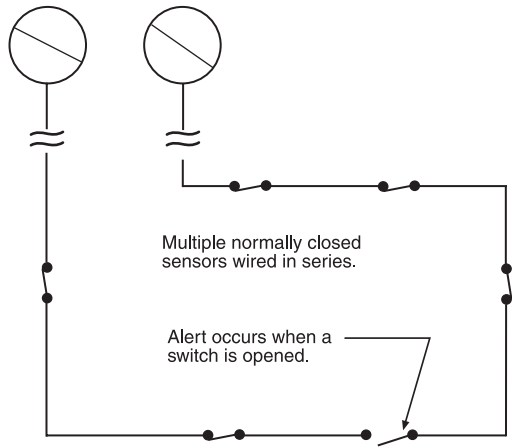


Figure 8: Connecting multiple N.C. sensors to one input terminal

Normally Open Sensors

To wire several normally open sensors to one Dry Contact input, connect them in parallel. To do this, take one lead from each sensor and attach it one of the Dry Contact Input terminals. Then take the second lead from each sensor and attach it to the corresponding ground terminal. See Figure 9.

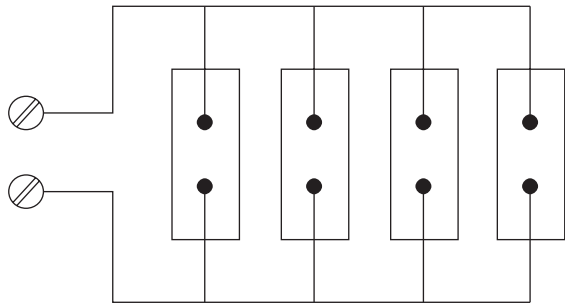


Figure 9: Connecting multiple N.O. sensors to one input terminal

Wiring Sensors to Analog Inputs

The WTU-14 has 6 Analog inputs that can be used to monitor 10K Thermistors (temperature) or 4–20mA transducers. Analog transducers are wired to the terminals labeled A1 through A6. The corresponding Ground terminals are located on the lower level terminal strip. The input must be configured by setting the corresponding jumper in either the Temperature or 4–20mA position. See figure below:

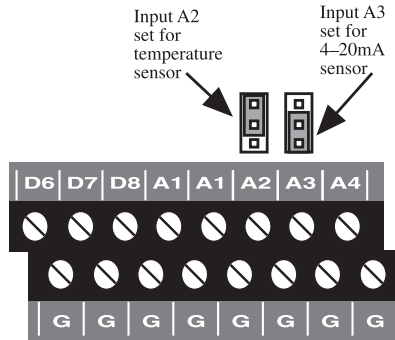


Figure 10: Input A2 configured for temp, A3 configured for 4-20mA

Temperature: The unit will accept 10K thermistors. These should be wired to an Analog Input terminal and the adjacent ground terminal. For compatible thermistors check the accessory list or thermistor data in the appendices. 10K Thermistor temperature range: -60°F to 175°F (-51°C to 79°C).

4–20mA: A 4–20mA transducer requires you to have an external DC power supply for the transducer. Connect the positive wire of your transducer to the positive terminal of your DC power supply. Connect the negative terminal of the transducer to an Analog Input terminal on the Skymetry WTU-14. Connect the negative terminal from your power supply to the adjacent ground terminal on the WTU-14.

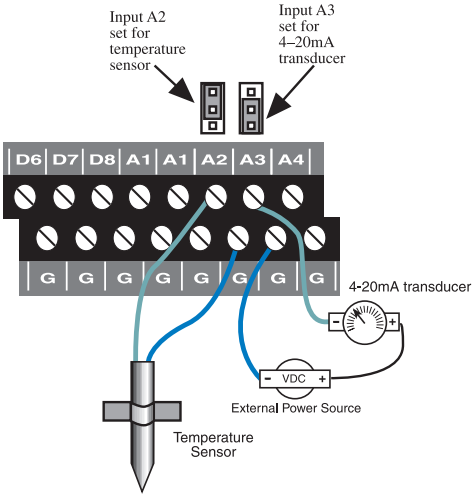


Figure 11: A thermistor and a 4-20mA transducer connected to the unit

Wiring Recommendations

The Skymetry WTU-14 will work fine in indoor environments using unshielded cable. When wiring will be subject to long lengths (>100') or if run outdoors, it is highly recommended that shielded cable be used and that the shield be connected to an earth ground. This is particularly important for sensor wires that are run in conduit with other noise-generating conductors, such as 60Hz AC. It is strongly recommended that input wiring be run in a conduit separated from AC power or output wiring. When wire runs are long or are in close proximity to large power consuming, power generating, or power switching equipment, it is highly recommended that shielded wire be used.

Also, be sure to use the appropriate gauge wire based on the distance and sensor type. See chart below:

<u>Wire Gauge</u>	<u>Thermistor</u>	<u>NO/NC Contact & 4–20mA</u>
#24	250'	1000'
#22	500'	2000'
#20	1000'	4000'



Figure 12: Wire stripped for connection

NOTE: All wiring should comply with Section 17 of the UL requirements.

LED Indicators

The LEDs provide on-site alarm and status information. Listed below are descriptions of how the LEDs work.

ALARM:

LED Off: No alarms

LED Blinking: Unacknowledged alarm exists

LED On: Acknowledged alarm exists

REGISTERED:

LED Off: Not registered (unit not activated)

LED Blinking: Skymetry is sending or receiving messages

LED On: Registered

IN RANGE:

LED Off: Not in range of wireless network

LED On: In range of wireless network

BATTERY OK:

LED Off: No Battery

LED Blinking: Battery condition low

LED On: Battery OK

POWER OK:

LED Off: Power is Off

LED Blinking slow: Power very low (unit hibernating)

LED Blinking fast: Power is low

LED On: Power is OK

OUTPUT #1:

LED Off: Output Relay #1 is off.

LED On: Output Relay #1 is on.

OUTPUT #2:

LED Off: Output Relay #2 is off.

LED On: Output Relay #2 is on.

Chapter 3: Software Installation

This section describes how to install and configure the Skymetry WTU-14 Programming Software for your computer.

Installing and Starting the Software

Minimum requirements:

- 486 or better computer (Pentium recommended)
- 4 MB of free disk space
- 16 MB RAM (32 MB RAM recommended)
- CD-ROM drive
- Graphics card compatible with Microsoft Windows 98, NT, 2000, or XP (such as VGA)
- Microsoft Windows™ 98, NT, 2000, or XP
- VGA or Super VGA monitor
- Mouse
- Serial Port

Installation

The Skymetry WTU-14 Programming Software is easy to install. Make sure that all Windows applications are closed before attempting to run Setup. If you encounter problems during installation, please call Phonetics Technical Support at 610-558-2700. The Skymetry Software will install to a directory named *C:\Program Files\Skymetry*, unless you choose to change the directory name.

1. Start Windows.
2. Insert the Skymetry CD-ROM. The installation program should run automatically. Follow the prompts as directed.

If the software does not install automatically, then click the *Windows Start* button, and select *Run*, then type in *d:\setup.exe*. Click *OK*. Follow the prompts as directed.

3. Reboot your computer when the installation is complete.

Activating your Skymetry WTU-14

Your Skymetry device *must* be activated on the wireless network before you can send or receive messages *and* before any local programming is performed for the first time.

To activate your Skymetry WTU-14 device, fill out the activation form included with the package and follow the instructions, or contact your sales representative with the device serial number.

Your Skymetry WTU-14 is activated when the “In Range” and “Registered” LEDs are lit.

Note: The *Registered* LED will blink when the Skymetry is sending or receiving messages.

Connecting Locally

The Skymetry Software will allow you to connect with the unit to view status and program it. First, connect a serial cable to a serial port on your computer. Connect the other end to the 9-pin RS-232 connector on the Skymetry WTU-14. Run the Skymetry Software. The following screen will appear.

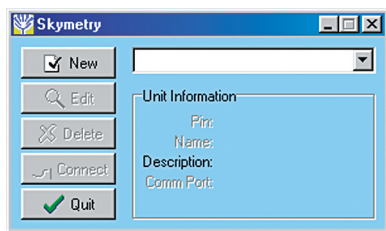


Figure 1: First-Run Unit Information form

Click the *New* button to set-up a new WTU-14 unit. The *Edit Skymetry Unit* screen will appear (see below).

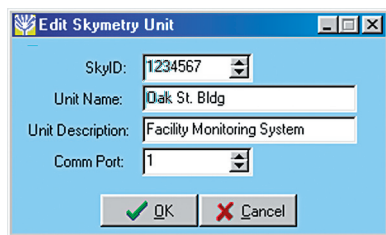


Figure 2: Edit Skymetry Unit

Enter the SkyID, Name, Description, and Comm Port settings for this unit. The unit Name can be up to 16 characters, the Description can be up to 30 characters. Click *OK*. Now click the *Connect* button and the software should connect and start downloading the programming from the unit. If this is the first time, you will have to enter the SkyID. A warning message will appear to prompt you.

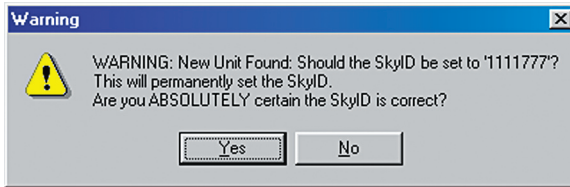


Figure 3: SkyID Warning message

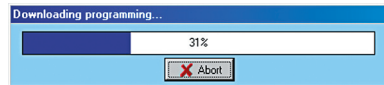


Figure 4: Programming Download in progress

If this was a new unit (factory default settings) the Name you entered on the edit screen will automatically be copied into the unit. After downloading the programming, the main Skymetry WTU-14 window will appear (see below).

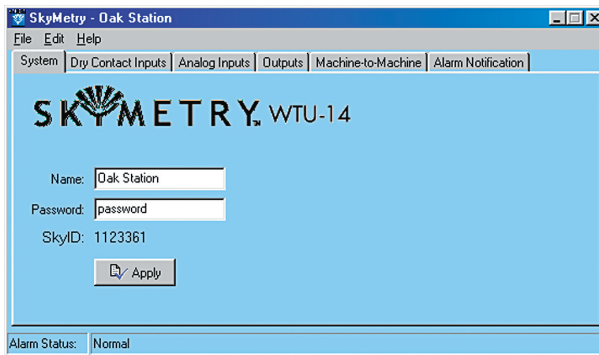


Figure 5: Main Skymetry Window: System Tab

This is a good time to enter a Password. The Password, while not required for local access, is required for all remote communication. The password can be up to 8 characters. Click *Apply* when finished.

Skymetry WTU-14 Web Page

You can view status and change settings in your Skymetry WTU-14 via the internet. This makes it possible to manage your unit from anywhere in the world. See Chapter 10 for detailed information on using the web page.

How it works

When the Skymetry WTU-14 is installed you should perform all programming via the local serial port. You must set the password. After you disconnect from the unit, the WTU-14 will begin to initialize the status and programming information on the Skymetry.com web page. This may take one to two hours depending on the number of programming parameters changed and the response time of the wireless network. Take care not to make additional programming changes until the web initialization has finished. To view status or make programming changes via the web page, go to www.skymetry.com and enter your *SkyID* and *Password*.

Note that the unit keeps track of programming items that have changed so that each time the *Programming Refresh Link* is clicked, only the changed items are sent. To get just the current status, you should click the *Status Refresh Link*. This will retrieve the latest input status from your unit. It will take a few minutes for this process to execute.

Note: Each time you click the Status or Programming Refresh links, data will be sent to and from your WTU-14 unit. This will use data messages. Once you exceed your data message limit, additional charges will apply.

Chapter 4: Input Programming

The Skymetry WTU-14 features 8 dry contact inputs and 6 analog inputs. The analog inputs are configurable as temperature or 4–20mA. The contact inputs can be used with Normally Open (NO) or Normally Closed (NC) sensors. The analog inputs can be used with 10K thermistors for temperature monitoring (available from Phonetics) or any 4–20 mA transducer. The monitored temperature range is -60° to 175° F (-51° to 79° C). Programmable table values can be entered when using 4–20mA transducers to scale the reading to the appropriate units of measure.

Note: It is highly recommended that if you make any programming changes locally (at the unit via the serial port) after your web page has been initialized, that you click the *Programming Refresh* Link on the web page soon thereafter. This is to ensure that the information you are viewing on the web page is up to date. This will also ensure that the alarm log information displayed on the web page is accurate.

Alarm States

Each Dry Contact or Analog input is monitored based on the programming parameters that define the input type and the alarm limits for each input. Based on this programming all inputs will always be in one of four *Alarm States*: Normal, Alarm, Unacknowledged Alarm, or Normal-Unacknowledged. Each of these alarm states is defined below:

A “**Normal**” alarm state means that an input is either:

- a) Within the programmed alarm limits.
- b) A Normally Open input is open, or a Normally Closed input is closed.
- c) An input is beyond its limits or is opposite of its programmed normality, but has not yet met its programmed alarm *Recognition Time*.

An input that is in an “**Alarm**” state means that:

- a) The selected input is currently beyond its programmed alarm limits or is opposite of its programmed normality.
- b) The selected input has exceeded the programmed recognition time.
- c) The alarm has been acknowledged.

An input that is in an “**Unacknowledged Alarm**” state means that:

- a) The selected input is currently beyond its programmed alarm limits or is opposite of its programmed normality.
- b) The selected input has exceeded the programmed recognition time.
- c) The alarm has not been acknowledged.

An input that is in a “**Normal but Unacknowledged**” state means that:

- a) The selected input is within its programmed alarm limits.
- b) A Normally Open input is open, or a Normally Closed input is closed.
- c) A prior alarm on the selected input has not yet been acknowledged.

Dry Contact Inputs

The 8 dry contact inputs can be programmed for normally open (NO) or normally closed (NC) operation. In addition, you can have the Skymetry WTU-14 count the number of times the input changes state (pulse count) and maintain the amount of time that the input is in the opposite state (Run Time). Click on the *Dry Contact* Tab to display the main status screen.

Dry Contact Inputs	Value	Alarm State	Pulse Count	Run Time
1 Pump 1 Run	Open	Normal	1591	760d 03h 33m 12s
2 Pump 2 Run	Open	Normal	1295	12h 30m 00s
3 High Alarm	Open	Normal	--	--
4 Door Alarm	Open	Normal	--	--
5 Pump 1 Alarm	Open	Normal	--	--
6 Pump 2 Alarm	Open	Normal	--	--
7 Gen. Run	Open	Normal	2	0h 57m 45s
8 Low Fuel	Open	Normal	--	--

Alarm Status: Normal

Figure 1: Dry Contact tab

This screen displays the current status of all 8 dry contact inputs. If any of the inputs were in alarm the *Alarm State* column would display the word “Alarm.” If the alarm was unacknowledged, the Alarm State would say “Alarm;Unack” and a button would appear at the bottom of the screen to acknowledge the alarm.

Dry Contact Programming

Click the input name to bring up the properties screen for the selected input. The following screen will appear:

Name:

Configuration

☒ Enabled

Type:

☒ Run Timer ☒ Pulse Counter

Pulse Count Multiplier:

Alarm Options

☒ Enable Alarms

☐ Alarm on Return-to-Normal

Recognition Time: seconds

☒ Reset Time: minutes

Current Status

Value: Open

Alarm: Normal

Pulses: [1591](#)

Run Time: [760d 03h 33m 12s](#)

Figure 2: Dry Contact properties

If a dry contact changes from its Normal state to the opposite state for the duration of the programmed recognition time, the input will go into alarm. Note that it must be a continuous change to be recog-

nized as an alarm. Once an alarm trips, the unit will begin its notification sequence (unless you are online through the serial port, in which case you can acknowledge the alarm directly and cancel the notification process). Listed below are definitions for each of the parameters for programming the dry contact inputs.

Configuring the Input Name

The input *Name* is used to describe the condition being monitored. It can be up to 16 characters.

Input Enable/Disable

A channel must be *Enabled* for the input to be read by the WTU-14. When a channel is enabled its status will appear on the status screen and on the web page.

Configuring the Input Type

The input *Type* can be either Normally Open or Normally Closed. When an input changes from its normal condition to the opposite condition, the Pulse Count (if enabled) will increment, the Run Timer (if enabled) will start running, and the Alarm Recognition timer will start running (if alarms are enabled).

Configuring the Run Timer

The *Run Timer* can be used to track how long an input condition has existed. This can be useful for monitoring pump or generator run times. The value can be preset by clicking on the run time value on the lower right part of the screen.

Configuring the Pulse Counter

The *Pulse Counter* can be used to track how many times a contact closure has changed state. Other possibilities include: measuring rainfall from a tipping bucket rain gauge or measuring liquid flow from a pulsed output flow gauge. The maximum value of the Pulse Counter (after the multiplier is applied) is 2 billion. Minimum Pulse Width for Pulse Count: 50ms.

The *Pulse Count Multiplier* allows you to make each pulse equate to a greater value. For example, suppose a flow gauge outputs a single pulse for every 100 gallons. By setting the *Pulse Count Multiplier*

to 100 the Pulse Count value now becomes the actual total number of gallons measured by the gauge. The range of values for the Pulse Count Multiplier is 1 to 65,535.

Alarm Enable/Disable

The *Enable Alarms* checkbox activates the alarm processing functions for the selected channel. When the input exceeds the the programmed alarm limits and exceeds the programmed recognition time the notification process begins.

Alarm on Return-to-Normal

The Skymetry WTU-14 has the capability to notify you when an input (that had previously gone into alarm) returns to normal. When checked, *Alarm on Return-to-Normal* initiates this notification.

Alarm Recognition Time

The *Recognition Time* is the time required for a fault condition to qualify as an alarm event. The sensor/channel must remain beyond the limits or in a fault condition continuously for this entire period of time in order to become an alarm. The range of values is 0–32,767 seconds.

Alarm Reset Time

The *Reset Time* is the time allowed for an acknowledged alarm's fault condition to be corrected before the Skymetry WTU-14 resets (reactivates) the alarm and begins the message delivery process all over again. The minimum reset time is 30 minutes, the maximum is 32,767 minutes.

Analog Inputs

The 6 analog inputs can be programmed for 10K thermistor (temperature in degrees Fahrenheit or Celsius) or 4–20mA transducer. The Skymetry WTU-14 will maintain the minimum and maximum values reached for each channel. When 4–20mA is selected you can enter table low and high values to correlate the 4mA and 20mA signals to actual values for your application. Click on the Analog Inputs Tab to display the main status screen.

Analog Inputs	Value	Alarm State	Minimum	Maximum
1 Well Level	16	Normal	16	16
2 Outside Temp	53 Deg F	Normal	53 Deg F	53 Deg F
3 Cabinet Temp	81 Deg F	Normal	81 Deg F	81 Deg F
4 Fuel Level	38	Normal	38	38
5 Battery Temp	81 Deg F	Normal	81 Deg F	81 Deg F
6 Flow Rate	33	Normal	33	33
Battery	13.6 V	Normal	13.6 V	13.7 V
Power	16.8 V	Normal	12.8 V	17.1 V

Alarm Status: Normal

Figure 3: Analog Inputs tab

This screen displays the current status of all 6 analog inputs. If any of the inputs were in alarm the *Alarm State* column would display the word “Alarm.” If the alarm was unacknowledged the Alarm State would say “Alarm Unack” and a button would appear at the bottom of the screen to acknowledge the alarm.

Analog Inputs Programming

Name:

Configuration

☒ Enabled

Type:

Table Range: to

Calibration:

Alarm Options

☒ Enable Alarms

☐ Alarm on Return-to-Normal

Low Limit:

High Limit:

Recognition Time: seconds

☒ Reset Time: minutes

Current Status

Value: 16 Min: 16

Alarm: Normal Max: 16

Figure 4: Analog Inputs Properties

Configuring the Input Name

The input Name is used to describe the condition being monitored. It can be up to 16 characters.

Configuring the Input Type

The input *Type* can be temperature 10K(deg F), temperature 10K (deg C), or 4–20mA. Select the type to match your sensor.

Note: Be sure to put the input jumper in the correct position.

Input Enable/Disable

A channel must be Enabled for the input to be read by the Skymetry WTU-14. When a channel is enabled its status will appear on the status screen and on the web page. Select the type of analog input from the pulldown menu.

Setting Table Limits

When 4–20mA is selected, you can enter table low and high values to correlate the 4mA and 20mA signals to actual values for your application. For example, suppose you're using a 4–20mA transducer to measure the depth of water in a 15 foot well. Simply enter a Table Low value of 0 and a Table High value of 15 and the WTU-14 will scale the input to read between 0 and 15 feet.

Programmable range

Table Low/High: -16,334 to 16,333

Default settings

Table Low value: 0

Table High value: 100

Calibration

To compensate for minor variances in sensor accuracy, an offset may be programmed for each analog input. For example, if the above input were sensing temperature and was reading 3 degrees too low, then the calibration would be set at 3 as shown above, to obtain an accurate reading. Only Analog-type inputs can be calibrated.

Alarm Enable/Disable

The *Enable Alarms* checkbox activates the alarm processing functions for the selected channel. When the input exceeds the the programmed low or high alarm limits and exceeds the programmed recognition time the notification process begins.

Alarm on Return-to-Normal

The WTU-14 has the capability to notify you when an input (that had previously gone into alarm) has returned to normal, that is, returns to within the programmed alarm limits. When checked, *Alarm on Return-to-Normal* initiates this notification.

Setting the Alarm Limits

Each analog input has a programmable Low and High Alarm limit. When the input value goes beyond the programmed alarm limits for the duration of the recognition time, the WTU-14 will go into alarm and initiate the alarm notification process.

Programmable range

Table Low/High: -16,334 to 16,333

Default settings

Table Low value: 0

Table High value: 100

Alarm Recognition Time

The *Recognition Time* is the time required for a fault condition to qualify as an alarm event. The sensor/channel must remain beyond the programmed limits continuously for this entire period of time in order to become an alarm. The range of values is 0–32,767 seconds.

Alarm Reset Time

The *Reset Time* is the time allowed for an acknowledged alarm's fault condition to be corrected before the WTU-14 resets (reactivates) the alarm and begins the message delivery process all over again. The minimum reset time is 30 minutes, the maximum is 32,767 minutes.

Power Input

Power monitoring is a built-in function. The unit will go into alarm when the power level drops below 11.75V for the programmed recognition time. In this state the Power LED will blink.

Battery Input

Battery monitoring is a built-in function. The unit will go into alarm when the battery level drops below 12.0V for the programmed recognition time. In this state the Battery LED will blink.

Special Function Inputs

When the Skymetry WTU-14 is used for Pump Control, several of the inputs are dedicated to a specific task depending on whether *Dry Contact* or *Analog Level* is selected as the Pump Control method. The tables below identify which inputs are used and what function they serve. Refer to the Pump Control chapter for more information.

Dry Contact Fill/Drain Pump Control

Dry Contact Input #6 – Lead pump float switch

Dry Contact Input #7 – Lag pump float switch

Dry Contact Input #8 – All pumps off float switch

Analog Level Fill/Drain Pump Control

Analog Input #6 – connect to analog (4–20mA) level sensor

Chapter 5: Output Programming

The Skymetry WTU-14 has two relay outputs capable of switching up to 0.3A at 120VAC, or 1.0A at 24VDC. The outputs can be controlled in a number of ways both automatically and manually. Some examples are listed below:

- Each relay can be manually turned on or off through the PC software or via the WTU-14 web page.
- Either relay can be set to turn on when a particular alarm occurs.
- Either relay can be set to turn on when any alarm occurs.
- Either relay can be set to turn on when any digital or any analog alarm occurs.
- One or both relays can be programmed to operate in pump control mode (simplex/duplex) for fill or drain applications.
- A relay can be controlled automatically based on Dry Contact or Analog input values using greater-than, less-than, or equal-to statements (*See Chapter 7: Machine-to-Machine Control*).
- A relay may also be controlled by another Skymetry unit using machine-to-machine control. This allows the Skymetry WTU-14 to be used for distant pump/well control applications.

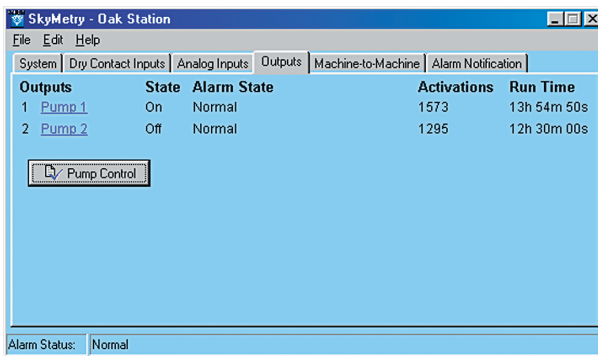


Figure 1: Outputs tab

Setting the Output Name

To set up the relay outputs, click on the *Outputs* tab. Next, click on the Name for Output 1 (blue) to bring up the *Output 1 Properties* screen. Enter a name for the output which describes the device that the output will be controlling.

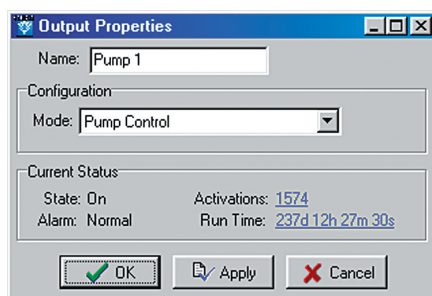


Figure 2: Output Properties screen

Configuring the Output Operating Mode

Click the drop-down arrow and select the operating *mode* for the output. You can have the relay automatically turn on for a variety of alarm conditions, either individual alarms or if any alarm occurs. If you will be controlling the output manually or via a machine-to-machine command, select *Manual* mode. If you will be using the output for fill or drain pump control, select *Pump Control*. For simplex pump control set only one output to Pump Control mode; for duplex pump control set both outputs to Pump Control mode. See Chapter 6 for more information on pump control programming.

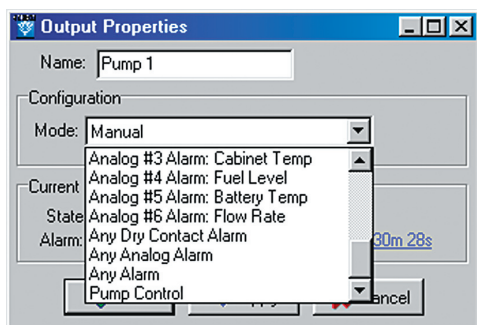


Figure 3: Output Operating mode

Switching the Output

To manually turn an output on, click on the current state (On or Off) and select the new state, then click *OK*. See the following screen.

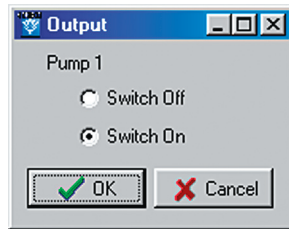


Figure 4: Output manual select

Output Status & Statistics

The Skymetry software will display the current state of the output as well as the number of times the relay has turned on, the total time the relay has been on (cumulative), and the alarm status of the output (valid in pump control mode only). This information can be useful for monitoring how often a device (pump, machine, generator, ...) has been activated and for how long. These values can be reset and/or preset by clicking on the displayed value and entering a new one.

Chapter 6: Pump Control

The Skymetry WTU-14 can be used in Fill or Drain pump control applications using either float switches or an analog level transducer. When used with Float Switches, dry contact inputs #6-8 have a dedicated special function (see below):

Pump Control using Float Switches

Dry Contact Input #6 – Lead pump float switch

Dry Contact Input #7 – Lag pump float switch

Dry Contact Input #8 – Pumps-off float switch

When performing pump control using an analog level transducer (4–20mA), analog input #6 is designated as the *well level input*.

Note: Only normally-open float switches can be used for pump control (e.g. the switch is open when no water is present).

How it works—Float Switches

When performing drain pump control using float switches, three floats are required: Lead, Lag, and Pumps-Off (see Fig 1). The Lead float determines when to turn on the first pump. If the first pump is unable to bring the level below the Pumps-Off float, then the Lag float will close, turning on the second pump. When the level drops below the Pumps-Off float, both pumps are turned off. If any of the floats get stuck (i.e. the lead and pumps-off floats closed, or the lag and pumps-off floats closed) then both pumps will be turned on and an alarm will be tripped on the output or outputs in question. In duplex mode, the WTU-14 will automatically alternate between the two pumps to facilitate uniform run time between the two.

If only one relay output is set to pump-control mode, then simplex control is performed. In Simplex mode only the Lead float (Dry Contact #6) and Pumps-Off float (Dry Contact #8) are required. Either output relay can be used in simplex mode.

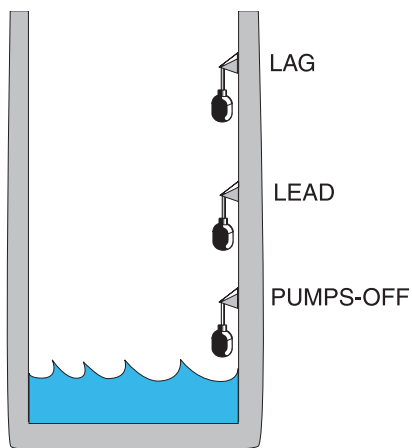


Figure 1: Float positions for a drain application

In a Fill application, the Lag and Pumps-Off floats would change position as shown below:

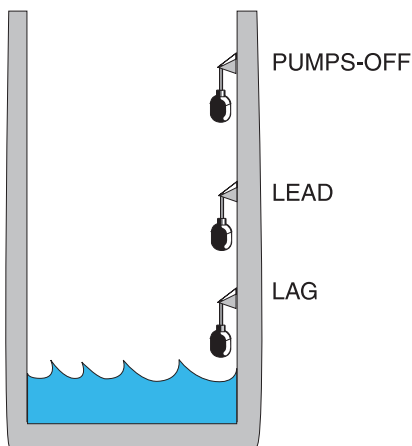


Fig 2. Float positions for a Fill application

In this case, the pumps are attempting to keep the well full. When the well is full all three floats are closed. If the level drops below the Lead float, then the first pump will turn on. If the level rises above the Pumps-Off float then the pump will turn off. If the level continues to fall below the Lag float, then the 2nd pump will turn on. Both pumps will remain on until the Pumps-Off float closes.

If only one relay output is set to pump-control mode, then simplex control is performed. In Simplex mode only the Lead float (Dry Contact #6) and Pumps-Off float (Dry Contact #8) are required. Either output relay can be used in simplex mode.

How it works—Analog Level Sensor

When performing pump control with an analog level sensor, the Lead, Lag, and Pumps-Off levels are programmed into the Skymetry software. The unit then measures the actual level on Analog Input #6 and turns on the appropriate relay outputs. If both outputs are set to *Pump Control* mode, then alternating duplex control will be performed. If only one output is set, then Simplex control will be performed. The analog level sensor must be a 4–20mA transducer that is selected and calibrated based on the depth of the well. The specified output of the transducer must be entered into the Table Range settings for Analog Input #6.

Installation Recommendations

Be sure to install and wire the Skymetry WTU-14 and associated equipment in accordance with all local codes and regulations. Adhere to Standard Practice/Best Practice policies when installing and wiring any control system. Be sure to include hand-operated switches to disconnect power on all pumps/equipment to insure worker safety when installing and servicing equipment.

Programming for Pump Control

To program the unit for Pump Control, click on the *Outputs* tab.

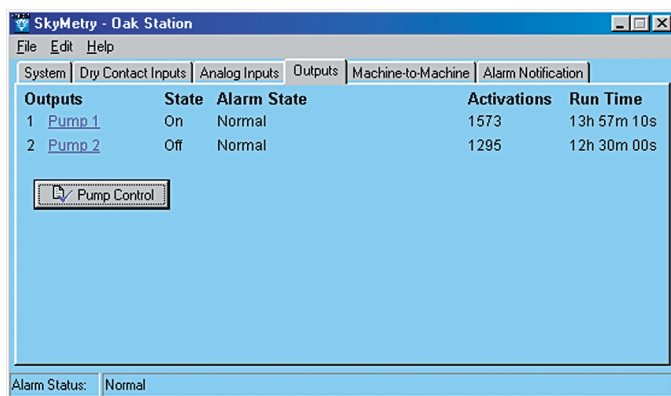


Figure 2: Output properties showing pump control

Next, click on the *Pump Control* link. This will bring up the pump mode setup screen. Next, select the type of pump control you want to do:

- Drain Analog Level
- Drain Dry Contact Floats
- Fill Analog Level
- Fill Dry Contact Floats

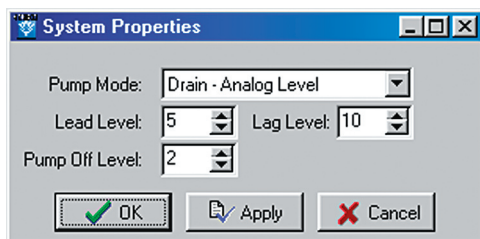


Figure 3: Pump Mode—Analog programming

If you select one of the *Analog* modes, you will have to fill in the Lead, Lag, and Pumps-Off fields. In *Dry Contact Float* mode these fields are disabled. Enter the appropriate values and click *OK* or *Apply*.

Next, click on the *output* to use for Pump Control. Click the drop-down box and scroll to the bottom to select *Pump Control*. Click *OK* or *Apply*. This will activate the Pump Control logic. Make sure all input devices and equipment are operational and ready for use.

For test purposes you may wish to use hand operated switches to manually control the pumps and simply watch the system LEDs to see if the Skymetry WTU-14 is functioning properly. If you are using “duplex” pump control, select the other output and set it for *Pump Control* mode also. After verifying that the unit is functioning properly, move your hand-operated pump switches to “Auto” and verify that the WTU-14 is properly controlling the system.

Output Wiring

The output relays on the Skymetry WTU-14 are for low current control signals (0.3A 120VAC/1.0A 24VDC maximum).

DO NOT directly connect the power for the pumps to these relays—**THIS WILL PERMANENTLY DAMAGE THE WTU-14.**

Use the WTU-14 outputs to control intermediate motor contactors/relays that will switch actual power to the pumps.

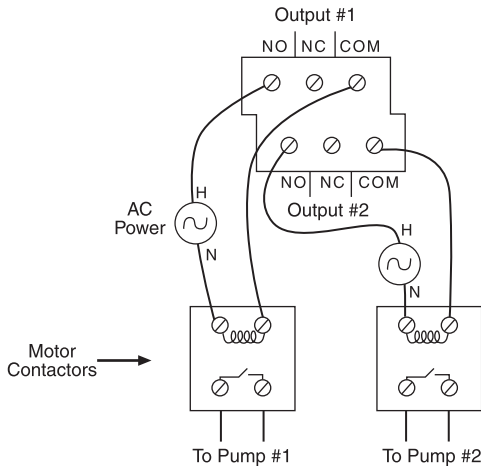


Figure 4: Output wiring to two pumps

Chapter 7: Machine-to-Machine Control

The Machine-to-Machine Control feature allows you to control outputs of other Skymetry WTU-14 units (or outputs within the same unit) based on input conditions. For example, you can switch an output on a WTU-14 unit several miles away if an input on a different unit is greater than a specified value. The output being controlled must be set to manual mode. Up to 8 machine-to-machine control events can be configured per WTU-14 unit. Note that when an input condition causes an output to change state, a separate event must be programmed to make the output change back. For example, if you program output #1 to turn on when input #5 is greater than 60, the output will **not** turn off when the input drops below 60. A separate event must be programmed to make the output turn off when the input is less than 60.

To program Machine-to-Machine Control click on the Machine-to-Machine Tab. The following screen will appear:

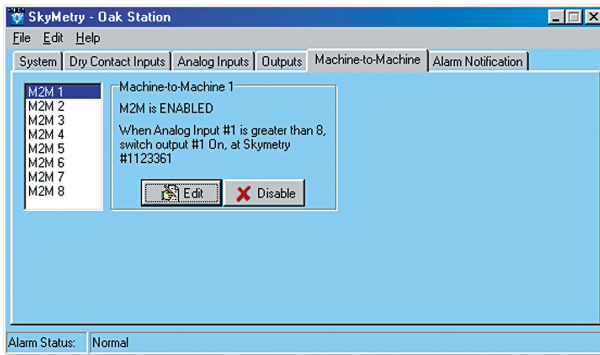


Figure 1: Machine-to-Machine tab

The 8 peer-to-peer events are listed in the window to the left. Clicking on each one will display a description of the control event programmed for each. To program a new peer-to-peer event click on the first unused (Disabled) peer event and click the *Edit* button. The following screen will appear:

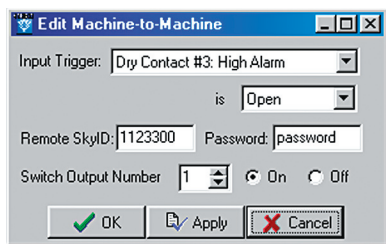


Figure 2: Peer-to-peer Edit screen

Click the down arrow in the *Input Trigger* field to select the input that will initiate the event. If you select a Dry Contact input, you can have the event occur when the selected input goes from *Open-to-Closed* or *Closed-to-Open*. If you select an Analog input you can have the event occur if the input is *equal-to*, *greater-than*, or *less-than* a specified value.

Enter a value for the comparison (range: -16,384 to 16,383).

Note: peer-to-peer events are triggered as soon as the input meets the trigger conditions. There is no recognition time applied in this case. Also, peer-to-peer events will not be executed while you are on line locally.

Next, enter the *SkyID* and *Password* of the WTU-14 unit whose output you want to switch. Select the output number and action (either ON or OFF). Click *Apply* or *OK* when finished. Remember, the target output must be set to manual mode, otherwise the command will be ignored. If the password is wrong the command will be ignored as well.

Local Output Control

You can perform control logic using the same inputs and outputs on a single WTU-14 unit. If you want to switch an output on the same Skymetry WTU-14 as the input, then simply enter the unit's own SkyID (a password is not required in this case). The output must be set to *manual* mode. Local output control does not use any airtime and also executes instantly (as long as there are no preceding peer-to-peer events that must communicate with a different WTU-14 device).

Important Information and Warnings

- It may take several minutes for the peer-to-peer command to reach the destination Skymetry WTU-14.
- Peer-to-peer commands are processed in a sequential, non-pre-determined order. This means that if more than one command is triggered, the subsequent commands must wait until the currently processed command is finished. If two peer-to-peer commands are triggered simultaneously that affect the same output, the order of the processing cannot be guaranteed.
- Both the source and destination WTU-14 devices must be powered on and operational for peer-to-peer commands to operate correctly.
- If the unit is in the middle of alarm processing, peer-to-peer commands may be delayed while alarms are being sent.
- Peer-to-peer commands are not processed while logged in with the PC software. The user should log off and the serial cable should be unplugged during normal operation to ensure that peer-to-peer commands are properly processed.
- Setting peer-to-peer trigger values too close can cause output oscillations. Peer-to-peer commands are an advanced feature and should be well thought out. Do not use them for critical applications where the risk is unacceptable.
- All peer-to-peer control actions will use a wireless message packet.

Sample Application

Suppose you had a well and a pump which were several miles apart. When the pump runs, it fills the well. Your goal is to maintain a certain level in the well. If you place one WTU-14 unit at each location you can have two peer-to-peer events accomplish your goal. In addition, you can use the WTU-14 inputs to monitor other key items such as:

- well level too low
- well level too high

- pump failure
- power failure
- generator on
- temperature

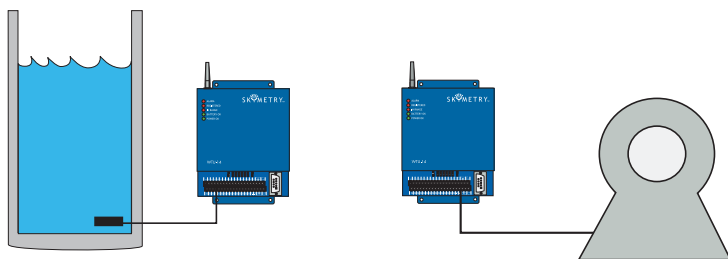


Figure 3: Well and Pump Control via Machine-to-Machine Commands

Let's suppose the well level is 25' and you need to maintain the level between 5' and 20'. The first thing you would need is a level transducer in the well. Next, program your two machine-to-machine events into the WTU-14 located at the well. The first would be to turn ON the pump if the level is *Less-Than* 5'. The second event would be to turn the pump OFF if the level is *Greater-Than* 20'. Consider the rate at which the well fills when the pump is running, in order to account for the machine-to-machine command delay time between the WTU-14 units. Also note that machine-to-machine control is completely independent of alarm processing, so you can also trip high or low-level alarms based on the well level.

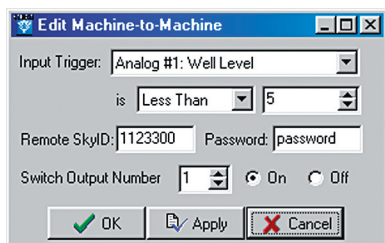


Figure 4: Turn Pump On if Level is Less than 5 feet

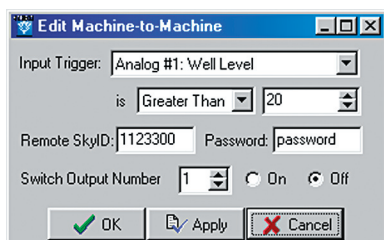


Figure 5: Turn Pump Off is Level is Greater than 20 feet

Chapter 8: Alarm Notification

The Skymetry WTU-14 can deliver alarm message notifications by voice phone call, internet e-mail, and text messaging to various messaging devices and cell phones. A total of 24 notification destinations can be programmed to be contacted in the event of an alarm. The unit also lets you to set an escalation level for each destination, allowing you to have a group of people contacted first (tier 1) and, if the alarm is not acknowledged, a second group of people (tier 2) contacted. You can program up to 24 tier levels of destinations and include a programmable delay time between each tier.

How does notification work

Once an alarm occurs, the Skymetry will begin sending its alarm message to the programmed destinations. The unit will start with destinations at tier 1. Once the *Tier Delay* expires, the unit will start sending alarm messages to destinations in the next tier. The *Tier Delay* time begins as soon as the alarm occurs, so if it were programmed to 60 minutes, the next tier would start receiving alarm messages one hour after the alarm occurred. The Skymetry will send its alarm message to each destination until it receives acknowledgment, or it will automatically acknowledge the alarm after all destinations have been sent the message or when the last tier delay time has expired.

Note: If you are logged in through the serial port, no alarms will be sent until you log off and disconnect the serial cable. If you acknowledge the alarm through the software before logging off, no alarm messages will be sent. This can be useful for performing on-site maintenance or testing the system. If you are not logged on through the serial port the alarm messages will be sent immediately, one at a time.

Voice Phone Call

The WTU-14 can send alarm messages via a voice telephone call. It does this without having a telephone line connected to the unit. When an alarm message is sent as a voice call the number is dialed from the Skymetry Messaging Service Center. The message is spoken from a computer that will customize the message based on the programming in your Skymetry WTU-14 including the programmed *Unit Name*, *Destination Name*, *SkyID*, and *Input Name*. To program a Voice destination, click on the *Alarm Notification* tab.

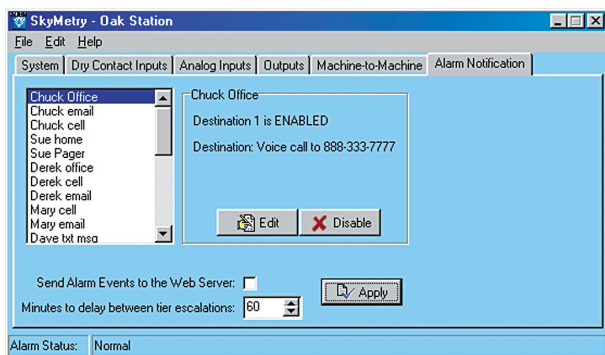


Figure 1: Alarm Notification

This screen provides a list of the programmed alarm destinations. To program or change a destination's information, click on the name of the person to edit (or select *unused* for a new entry) and then click the *Edit* button. The *Edit Destination* screen will appear:

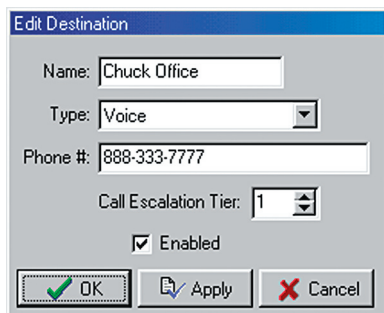


Figure 2: Contact Edit for Voice Call

Enter the name for this destination (up to 12 characters) and in the *Type* field select *Voice*. In the *Phone #* field enter the area code and telephone number. A sample alarm telephone call is shown below:

“Hello, Sensaphone Inc. has a message for ‘Mike’
<*destination name*>.”

“To accept the message press 1.”

“To cancel the message press 2.”

{**press 1** to hear the alarm message}

“Skymetry alarm at 'Oak Station' <*unit name*>,
SkyID number ‘1123350’ <*skyid*>.”

“Contact 4, ‘High Float’ <*input name*> is in alarm.”

To acknowledge send ##### <*alarm ID*>

“To replay message, press the * key.”

“To reply to the message, press 2.”

“To end this call, press 3.”

To acknowledge the alarm you must press “2” (*reply to the message*). Next, enter the four digit *alarm ID* that was spoken at the end of the message followed by the “#” key. When prompted to send the message, enter the “#” key again. The *alarm ID* is a unique number that identifies the alarm and the destination. Note that a different *alarm ID* number will be sent to each destination—even for the same alarm.

Internet E-Mail

The WTU-14 can send alarm messages to internet e-mail addresses. The alarm message will comprise information from within your Skymetry WTU-14 including the programmed *Unit Name*, *Destination Name*, and *Input Name*. To program an e-mail destination, click on the *Alarm Notification* tab.

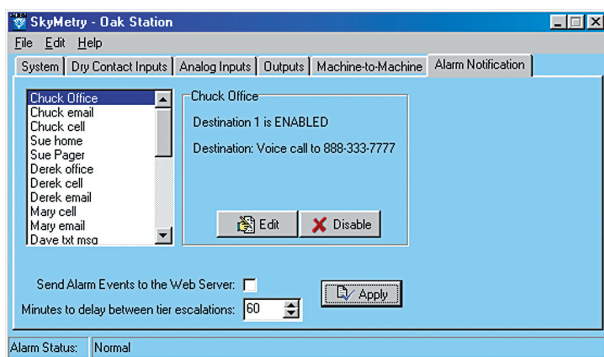


Figure 3: Alarm Notification

This screen provides a list of the programmed alarm destinations. To program or change a destination's information, click on the name of the person to edit (or select *unused* for a new entry) and then click the *Edit* button. The *Edit Destination* screen will appear:

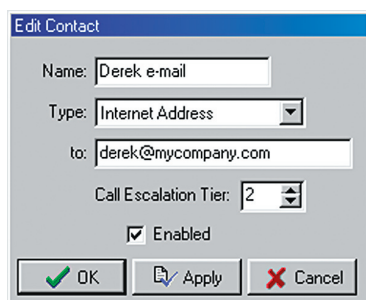


Figure 4: Destination Edit for E-mail

Enter the name for this destination (up to 12 characters) and in the *Type* field select *Internet E-mail*. In the *To:* field enter the e-mail address (up to 34 characters).

Warning: Before entering an e-mail address into the Skymetry WTU-14, be sure to test the address first, using your computer and standard email software. Verify that the address is working and that the message is delivered.

A sample e-mail alarm message is shown below:

To: mike@mycompany.com
From: 1123350@mobilemessage.com

High 4-20mA ALARM at Oak Station Sky ID#1123350

Analog 1 Well level is now 26

Level crossed limit of 15

To acknowledge, send 1302

Alphanumeric Pager

The WTU-14 can send alarm messages to your alphanumeric pager or mobile text messaging device. The message will be sent to an e-mail address for your pager based on your paging provider and your pin number. The provider-format list below will instruct you on how to enter the e-mail address for your particular service provider. The alarm message will comprise information from within your Skymetry WTU-14 including the programmed *Unit Name*, *Destination Name*, and *Input Name*. To program an e-mail destination click on the *Alarm Notification* tab.

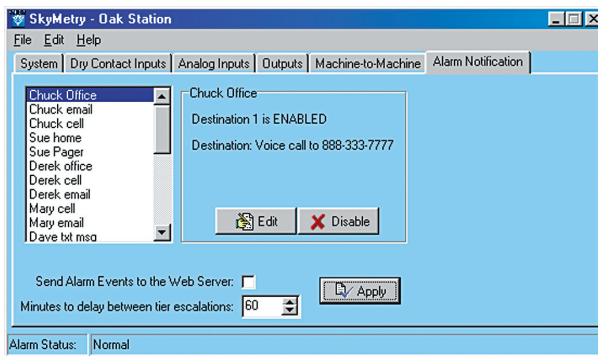


Figure 5: Alarm Notification

This screen provides a list of the programmed alarm destinations. To program or change a destination's information, click on the name of the person to edit (or select *unused* for a new entry) and then click the *Edit* button. The *Destination Edit* screen will appear:

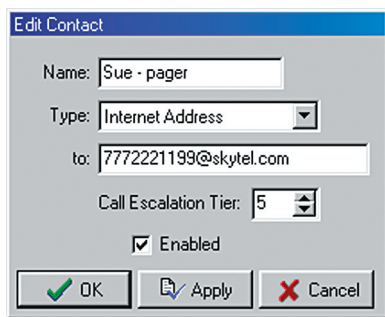


Figure 6: Destination Edit for Alphapager

Enter the name for this destination (up to 12 characters) and in the *Type* field select *Internet E-mail*. In the *To:* field enter the e-mail address as described in the list below (up to 34 characters).

Warning: Before entering an e-mail address into the Skymetry WTU-14, be sure to test the address first, using your computer and standard email software. Verify that the address is working and that the message is delivered.

Paging Provider

E-mail Address Format

Advantage Communications	10digitpagenumber@advantagepaging.com
Airtouch Pagers	10digitpagenumber@myairmail.com
Arch Wireless	10digitphonenumber@archwireless.net, or 10digitphonenumber@epage.arch.com
AT&T Paging	10digitphonenumber@page.metrocall.com
Bell South (Blackberry)	number@bellsouthtips.com
Carolina Mobile Communication	10digitpagenumber@cmcpaging.com
Central Vermont Comm.	10digitpagenumber@cvcpaging.com
Communication Specialists	7digitpin@pageme.comspeco.net
Communication Specialist Co.	pin@pager.comspeco.com
Cook Paging	10digitpagenumber@cookmail.com
Digi-Page / Page Kansas	10digitpagenumber@page.hit.net
GrayLink / Porta-Phone	10digitpagenumber@epage.porta-phone.com
GTE Paging	10digitphonenumber@airmessage.net
Indiana Paging Co.	last4digits@pager.tdspager.com

Infopage Systems	pinnumber@page.infopagesystems.com
JSM Tele-Page	pinnumber@jsmtel.com
Metrocall	10digitphonenumber@page.metrocall.com
Metrocall 2-Way	10digitphonenumber@my2way.com
MobileComm	7digitPIN@mobilecomm.net
Morris Wireless	10digitpagenumber@beepone.net
Motient	username@isp.com
Pagemart Advanced and 2-Way	10digitphonenumber@airmessage.net
PageNet Canada rim devices	10digitphonenumber@pagegate.pagenet.ca
ProPage	7digitpagenumber@page.propage.net
RAM Page	number@ram-page.com
Satellink	10digitpagenumber.pageme@satellink.net
SkyTel	7digitPIN@skytel.com
ST Paging	pin@page.stpaging.com
Teletouch	10digitpagenumber@pageme.teletouch.com
TSR Wireless	pagenumber@alphame.com
Verizon Wireless	10digitphonenumber@MyAirMail.com
WebLink Wireless	10digitphonenumber@airmessage.net

Text Messaging to Cell Phones

The WTU-14 can send alarm messages to your wireless cellular telephone. The message will be sent to an e-mail address for your cell phone based on your cellular provider and your telephone number. The cell-provider/format list below will instruct you on how to enter the e-mail address for your particular service provider. The alarm message will be composed of information from within your Skymetry WTU-14 including the programmed *Unit Name*, *Destination Name*, and *Input Name*. To program an e-mail destination, click on the *Alarm Notification* tab.

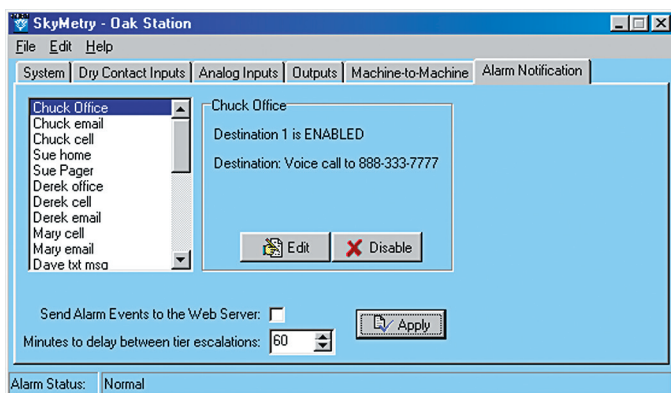


Figure 7: Alarm Notification

This screen provides a list of the programmed alarm destinations. To program or change a destination's information, click on the name of the person to edit (or select *unused* for a new entry) and then click the *Edit* button. The *Edit Destination* screen will appear:

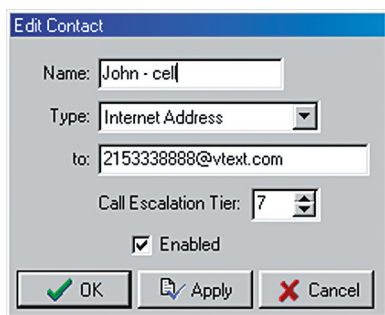


Figure 8: Destination Edit for Cell Phone

Enter the name for this destination (up to 12 characters) and in the *Type* field select *Internet E-mail*. In the *To:* field enter the e-mail address as described in the list below (up to 34 characters).

Warning: Before entering an e-mail address into the Skymetry WTU-14, be sure to test the address first, using your computer and standard email software. Verify that the address is working and that the message is delivered.

Cellular ProviderE-mail Address Format

3 River Wireless	phonenumber@sms.3rivers.net
Airadigm (Einstein PCS)	10digitPCsnumber@einsteinsms.com
AirTouch Cellular	10digitphonenumber@airtouchpaging.com
Alltel	10digitphonenumber@alltelmessage.com, or 10digitphonenumber@message.alltel.com
AT&T Pocketnet PCS	10digitphonenumber@dpcs.mobile.att.net
ATT Wireless	10digitphonenumber@mobile.att.net
Bell South	10digitphonenumber@wireless.bellsouth.com
Bell South	phonenumber@sms.bellsouth.com
Blackfoot Communications	10digitphonenumber@pcs.blackfoot.net
Carolina West Wireless	10digitnumber@cwwsms.com
CellularONE	10digitphonenumber@mobile.celloneusa.com
Cellular One East Coast	phonenumber@phone.cellone.net
Cellular One PCS	phonenumber@paging.cellone-sf.com
Cellular One	phonenumber@cellularone.txtmsg.com
Cellular One	phonenumber@message.cellone-sf.com
CellularSouth	10digitphonenumber@csouth1.net
Cingular	10digitphonenumber@mobile.mycingular.net
Cleartnet	phonenumber@msg.cleartnet.com
Green's Communications	7digitphonenumber@pager.schmobile.com
MCI Phone	phonenumber@mci.com
Nextel	10digitphonenumber@messaging.nextel.com
Nextel	10digitphonenumber@page.nextel.com
Ntelos	number@pcs.ntelos.com
PacificBell/Nevada Bell	1+10digitphonenumber@pacbellpcs.com
PrimeCo	10digitphonenumber@primeco.textmessage.com
Qwest	10digitphonenumber@qwestmp.com
Rogers Canada	10digitphonenumber@pcs.rogers.com
SMF/Schuylkill Mobile Fone	7digitphonenumber@pager.schmobile.com
SouthernLinc	10digitphonenumber@page.southernlinc.com
Sprint	10digitphonenumber@messaging.sprintpcs.com
Suncom	10digitphonenumber@mobile.att.net
SunCom	number@tms.suncom.com
T-Mobile	10digitphonenumber@tmomail.net

T-Mobile	10digitphonenumber@voicestream.net
Telecorp	10digitphonenumber@mobile.att.net
Tritel	10digitphonenumber@mobile.att.net
Triton PCS	10digitphonenumber@mobile.att.net
U.S. West	10digitphonenumber@uswestdatamail.com
Verizon	10digitphonenumber@vtext.com
VoiceStream	10digitphonenumber@voicestream.net
Wyndtell	number@wyndtell.com

Acknowledgment via E-mail or Text Message

The alarm from the Skymetry WTU-14 can be acknowledged by replying to the alarm message that was sent to you. As long as you received the message on a two-way data device, you can simply reply back to send your acknowledgment. In the reply message, just enter the alarm ID number in the message. For example, if the alarm ID number was 1720, then you would reply with a “1720” in your reply message to indicate to the WTU-14 that you received and acknowledged the alarm message. A sample acknowledgment message is shown below:

To: 1123350@mobilemessage.com
From: Mike@mycompany.com
1720

Additional Information

If another alarm occurs while the unit is delivering messages for a previous alarm, the second alarm will be handled after the first is acknowledged.

You can use tier escalation to organize the destination delivery. Set each destination to its own tier level and set the delay to **two** minutes. In this case a new message will be sent every two minutes to the next tier level.

Rearranging the destination order can be done simply by changing the Tier Levels.

Chapter 9: Operation

After installation and programming have been completed, the Skymetry WTU-14 is fully operational. This chapter explains how the WTU-14 operates.

PART ONE: Alarm Notification and Acknowledgment

There are 3 stages to a complete alarm event: 1) Alarm Recognition, 2) Alarm Notification, and 3) Acknowledgment.

Note that not all fault conditions will go through each stage. For example, some may not meet the recognition time.

Alarm Recognition

- 1) The WTU-14 monitors 8 dry contact inputs, 6 analog inputs, main power, and battery backup. When the status of an input changes or exceeds user-programmed limits, it causes a fault condition.
- 2) If the fault condition lasts long enough to meet its programmed recognition time, the fault condition becomes an alarm and the WTU-14 begins the alarm notification sequence.

Alarm Notification

The WTU-14 can send alarms via Voice phone call, E-mail, Alphanumeric pager, or Text message to wireless (cell) phone.

Dialout Note: Call Progress

The Skymetry WTU-14 monitors call progress when dialing out in voice mode. If it dials out and encounters a busy signal or no answer it will wait about a minute and try again up to 3 times. If the call is answered by an answering machine or voice mail system the alarm message will likely not be recorded because it will be speaking while your greeting message is playing. Note that since the call was actually answered, the WTU-14 will consider the call completed and not dial it again.

Alarm Notification—Voice

When dialing out to a destination programmed as “voice,” the Skymetry WTU-14 waits for the phone to be answered, then recites its identification message, then the message identifying the input that has gone into alarm.

Below is an example of what the WTU-14 would say during a typical ‘voice’ notification:

“Hello, Sensaphone Inc. has a message for ‘Dave’ *<destination name>*.”

“To accept the message press 1.”

“To cancel the message press 2.”

{**press** 1 to hear the alarm message}

“Skymetry alarm at 'Oak Station' *<unit name>*, SkyID number ‘1123350’ *<skyid>*.”

“Contact 1, ‘Security’ *<input name>* is in alarm.”

“To acknowledge, send 1201 *<alarm ID>*”

“End of message”

“To replay message, press the * key.”

“To reply to the message, press 2.”

“To end this call, press 3.”

Alarm Notification—E-mail

When sending an alarm message via e-mail the WTU-14 will compose a text message based on the Unit's name, SkyID, Input name, Input type, current value, and alarm limit (where applicable). A sample alarm message is shown below:

To: derek@mycompany.com

From: 1123350@mobilemessage.com

Contact ALARM at Oak Station Sky ID#1123350

Contact 1 Security is in alarm

To acknowledge send 1202

Alarm Notification—Alphanumeric Pager

When sending an alarm message to an Alphanumeric pager, the WTU-14 leaves a text message on the display of the pager. A sample is shown below:

```
High 4-20mA ALARM at Oak Station Sky ID#1123361
Analog 1 Water level is now 21
Level crossed limit of 15
To acknowledge send 1203
```

Alarm Notification—Text Message to Cell Phone

When sending an alarm text message to a cell phone the WTU-14 leaves a message on the display of the phone. A sample is shown below:

```
High 4-20mA ALARM at Oak Station Sky ID#1123361
Analog 1 Water level is now 21
Level crossed limit of 15
To acknowledge send 1204
```

Tier Delay

You can group destinations into tiers and then program a delay time until the next tier gets called. This allows you to contact your primary personnel first and, if necessary, escalate the calling to the next level. Up to 24 tiers can be configured. The WTU-14 will start sending alarm messages to all destinations programmed in Tier 1. If the alarm is acknowledged, it will halt the notification process for that alarm and no additional alarm messages will be delivered. If all of the Tier 1 destinations have been sent the alarm message and no acknowledgement was received, the unit will wait the programmed *Tier Delay Time* and then start sending the alarm to the destinations in the next Tier. An example is described below:

Tier 1 destinations:	Tier 2 destinations:	Tier 3 destinations:
Chuck	Janet	Morton
Mary	George	Zach
Sue	Ron	Tony
Derek	Jason	
Dave	Carmen	

Tier Delay Time: 60 minutes

An alarm occurs at 8:00PM

The Skymetry WTU-14 starts sending alarm messages to members of Tier 1.

No one acknowledges the alarm.

At 9:00PM the Tier delay has expired and the unit begins to send alarm messages to members of Tier 2.

At 9:30PM the WTU-14 receives an acknowledgement message and the unit stops the notification process.

The people in Tier 3 do not get contacted.

Alarm Acknowledgment

Acknowledging an alarm will halt the alarm notification process. Voice notification alarms must be acknowledged during the original phone call. E-mail, Alphanumeric pager, and Cell phone alarms can be acknowledged by replying back to the original alarm message or by sending the unit a message with the alarm ID number. The sections below detail the procedure to acknowledge an alarm.

Alarm Acknowledgment—Voice Notification

“Hello, Sensaphone Inc. has a message for 'Dave' *<destination name>*.”

“To accept the message press 1.”

“To cancel the message press 2.”

{**press 1** to hear the alarm message}

“Skymetry alarm at 'Oak Station' *<unit name>*, SkyID number '1123350' *<skyid>*.”

“Contact 1, 'Security' *<input name>* is in alarm.”

“To acknowledge send 1101 *<alarm ID>*”

“End of message”

“To replay message, press the * key.”

“To reply to the message, press 2.”

“To end this call, press 3.”

To acknowledge the alarm you must press “2” (reply to the message). Next, enter the four digit *alarm ID* that was spoken at the end of the message followed by the “#” key. When prompted to send the message, enter the “#” key again. The WTU-14 will respond by saying: “Alarm sent.” The alarm has been acknowledged and the notification process stops. If the Touch-Tone acknowledgment code is not received, the Skymetry WTU-14 will continue to send alarm messages to the remaining destinations.

Note: An alarm cannot be acknowledged using a pulse (rotary) telephone.

Alarm Acknowledgment—Alphanumeric Pager

When sending an alarm message to an Alphanumeric pager, the WTU-14 leaves a text message on the display of the pager. If you have a two-way alphanumeric pager you can acknowledge the alarm by replying to the original message with the alarm ID number, which will acknowledge the alarm. For example, if the alarm ID was 1503, you would simply reply back with “1503.” If you do not have a two-way pager then you can send the WTU-14 an e-mail using either a computer or a cell phone. The e-mail address of your Skymetry WTU-14 is *skyID@mobilemssage.com*, where you would substitute the word *skyID* with your SkyID number. In the message area simply send the unit the alarm ID number.

Alarm Acknowledgment—Text Message to Cell Phone

When sending an alarm message to a cell phone, the WTU-14 leaves a text message on the display of the phone. You can acknowledge the alarm by sending a reply back to the WTU-14 with the alarm ID number, which will acknowledge the alarm. For example, if your alarm ID number was 1107, you would simply reply back with “1107.” Alternatively you can send the WTU-14 an e-mail using a computer. The e-mail address of your Skymetry WTU-14 is *skyID@mobilemssage.com*, where you would substitute the word *skyID* with your SkyID number. In the message area simply send the the alarm ID number.

Alarm Acknowledgment—Automatic

The Skymetry WTU-14 will acknowledge an alarm itself (automatically) if all of the destinations have been contacted and no acknowledgement was received.

PART TWO: Status Request

You can request a status report from your WTU-14 by sending it a command via e-mail. When the unit receives the command it will assemble a status report and send it back to the originating e-mail address. Only inputs that are *enabled* will be included in the report. If alarm monitoring is not enabled for a particular input, its status will be displayed as *disabled*. To request the status report you need the unit's password and skyID. The e-mail format to request a status report is shown below:

To: *skyID@mobilemessage.com* {replace *skyID* with your unit's skyID number}

Subject:

Message:

p *password* gst {replace *password* with your unit's password}

A sample e-mail Status Report is shown below:

```
D1: Pump 1 Run 243:33:12 1591 OK
D2: Pump 2 Run 012:30:00 1295 OK
D3: High Water 000:00:00 0 OK
D4: Door sensor 000:00:00 0 Alarm
D5: Pump 1 fault 000:00:00 0 OK
D6: Pump 2 fault 000:00:00 0 OK
D7: Gen. Run 000:57:49 2 Disabled
D8: Low Fuel 000:00:00 0 OK
A1: Well Level 16 OK
A2: Outside Temp 78 F Disabled
A3: Cabinet Temp 86 F OK
A4: Fuel Level 38 OK
A5: Battery Temp 81 F OK
A6: Flow Rate 33 OK
B: Battery 13.50v OK
P: Power 16.82v OK
O1: Pump 1 On 015:54:44 1573 OK
O2: Pump 2 Off 012:30:00 1295 OK
```


Chapter 10: Skymetry Web Page

The Skymetry Web Page is where you can check status, monitor data message usage, make programming changes, and even control outputs from any internet connected computer. In order for your unit to be accessible via the web page you must first change the password in your unit and then log out. This will instruct the unit to register with the Skymetry web server, setup an account for your unit, and perform a *Full Programming Update*. Note that it may take 1 to 2 hours for the web server to receive all of the programming information from your Skymetry WTU-14. Do not make any programming changes to your unit during this period. This initial *Full Update* will occur automatically and is included in your activation fee and does not count toward your monthly allowance.

Once the Skymetry web server has finished receiving the updates from your unit you can go to www.skymetry.com, enter your *SkyID* and *Password*, and click *Login*. The web page for your Skymetry WTU-14 will be displayed. The web page presents a view of the system which is very similar to the Skymetry PC Software, except for the fact that it is a snapshot of information from a specific point in time—it is not updating in real-time. To retrieve the latest values you must click either the *Status Refresh* or *Programming Refresh* links.

Note: It is highly recommended that if at any time you make any programming changes locally (at the unit via the serial port) that you click the *Programming Refresh* link on the web page soon thereafter, to ensure that the information you are viewing is up to date. This will also ensure that the alarm history information will also be accurate.

Status Refresh

You can retrieve the latest input and output values by clicking the *Status Refresh* link. This will send a message to the WTU-14 requesting the latest input and output status information. When

the unit receives the request it will immediately send back a reply. During this waiting period the web page will display the input and output values in green italics until the updated information returns. At the bottom of the screen is a time-stamp which indicates the date and time of the last update. Note that clicking the *Status Refresh* will use 5 to 7 data messages, depending on the amount of data transferred. You can minimize the number of data messages by disabling any inputs which are not being used.

Programming Refresh

The *Programming Refresh* command will refresh all Skymetry WTU-14 programming as well as input/output status. The first *Programming Refresh* is included as part of the activation fee and will not increment the data message counter nor be applied to your monthly allowance. You only need to click this button if you believe that programming changes may have occurred locally, at the unit, and you want to refresh the information on the web server.

Programming via the Web Page

You can change any parameter in your WTU-14 from the web page, just as you would using the Skymetry PC Software. All programmable items will appear as Blue links. For the inputs you can click on any item for that channel and the respective programming screen will appear. If you change an item and click *OK*, the change will be sent to your unit. This will take a few minutes to process. Similarly you can change Output programming, Notification programming, and Machine-to-machine programming.

Switching Outputs via the Web page

To switch an output, Login to the web page and click *Outputs*. Next, click on the Output number you want to switch. On the programming screen, locate the *State* field and select On or Off, then click *OK*. The command to switch the output will be sent to your unit. Note that this may take 1–2 minutes.

Account Usage

The main status screen displays an Account History containing the number of data messages used for the month as well as historical usage. Data messages are those used during a wireless data transfer to or from the unit. They are sent whenever an alarm is delivered, a machine-to-machine command is sent, programming changes are made, or if the *Status Refresh/Programming Refresh* links are clicked. The number of data messages used per transaction varies depending on the type of transaction and the programming parameters within the unit. Some typical values are listed below:

<u>Transaction Description</u>	<u>Data Messages</u>
Status Refresh	5–7
Programming Refresh	9–115
Machine-to-machine command	1
Voice Alarm	2–4
E-mail alarm	1–3
Alarm message to web server	1
Programming change (1 item)	2
E-mailed Status via GST command	2–7

Alarm History

An alarm history log is available on the web page to provide details on alarms that have occurred and whom acknowledged them. The log can be queried by entering a start and end date range, or by selecting one of the *QuickDates* options. You must have the *Send alarm events to the server* option enabled in order for the alarm events to appear on the web page. This option is configured on the Notification programming screen. Note that the time stamps appearing on the web page do not indicate when the alarm occurred, but rather the time that they were received by the web server.

Chapter 11: Testing the Skymetry WTU-14

It is extremely important that you test the system after installation to make sure that it is working properly and that all programming is correct. In addition, it is highly recommended that you test and/or verify proper operation on a weekly basis to ensure that the system continues to function as required. (*See Appendix A.*) The following items should be tested:

- Notification to all destinations to make sure that each one is programmed correctly and that the messages are actually delivered.
- Input testing to make sure that the system is reading them correctly and that when a fault occurs the system responds appropriately.
- Output testing to make sure they are wired correctly and that they switch on and off when instructed.
- Control programming—Local control, Machine-to-machine, or Pump control—to make sure that the system is functioning properly, as required for your application.

Notification Testing

Create an alarm and confirm that all destinations receive the alarm message. This can be done by forcing an input into alarm, by temporarily adjusting an alarm limit, or by changing the normality of a Dry Contact input. The Alarm LED on the front of the unit will begin blinking when an alarm has occurred. Be sure to disconnect from the serial port after creating the alarm, otherwise the notifications will not be sent. After confirming that all notification messages were delivered, correct the alarm condition and/or adjust your programming as required.

Input Testing

Check the current value of all of the programmed Dry Contact and Analog Inputs. Make sure that the values being displayed are correct.

For Dry Contact inputs, momentarily reverse the input condition to verify that the unit recognizes the change of state. For example, if you have a normally open sensor connected to Dry Contact #1, force that sensor closed and verify that the unit displays the value as closed.

For analog inputs, verify that the input reading matches the entity being measured. For example, for temperature inputs confirm that the unit is reporting the correct temperature.

For 4–20mA inputs, confirm that the level or value being displayed in the WTU-14 matches the actual conditions being measured.

Output Testing

Confirm that the power limitations of the outputs will not be exceeded. The WTU-14 outputs are rated for a maximum of 0.3A at 120VAC or 1.0A at 24VDC. Test the outputs by switching them on and off manually and confirming that the device being controlled turns on and off. The Output LEDs on the front of the unit should also turn on and off.

Control Programming

For applications that utilize control programming it is important to test all scenarios that may affect system operation. This means you should test your system under normal operating conditions as well as abnormal (or failure) conditions to make sure that you have designed your system to operate under the worst-case scenario.

Note that Local and Machine-to-Machine control will not execute while you are connected locally.

To test Local control operation, force input conditions as necessary to activate the output(s). Confirm that the input-to-output control logic is executing properly. Test each programmed control algorithm separately to make sure that each one is functioning as desired.

To test Machine-to-Machine control, force input conditions as necessary to activate the output(s) on your remote WTU-14 device(s). Confirm that the outputs on the remote unit(s) have turned on or off as instructed. Test each programmed control algorithm separately

to make sure they are all functioning. Have the system go through a complete automated control cycle of your system to confirm that the unit and its programming are operating as intended.

Pump Control

To test Pump Control using float switches, force the float switch inputs open or closed as necessary, to make the output(s) turn on or off. In a Drain application the first pump would turn on if the Pumps-Off and Lead float switches were closed. The second pump would turn on if the Lag float switch also closed. Both pumps would then turn off when all three float switches opened. In a fill application, the first pump would turn on when the Pumps-Off and Lead floats opened. The second pump would turn on when the Lag float also opens. Both Pumps would turn off when all three floats closed.

To test Pump Control using a level transducer you can temporarily force the input level to a certain value by adjusting the calibration for the Analog Input. In a drain application, force the input to be above the Lead level and the first pump should turn on. If you then set the input above the Lag level, the second pump should also turn on. Setting the input below the Pumps-Off setting will turn both pumps off. In a fill application, setting the input below the lead level will turn the first pump on. Setting the input below the Lag level will turn on the second pump. Setting the input above the pumps-Off level will turn off both pumps.

Once you have confirmed that the WTU-14 is controlling the system properly, allow the system to operate automatically. Observe a complete Drain or Fill cycle and verify that the system is operating as required.

APPENDIX A: Checking Your Skymetry WTU-14 for Proper Operation

We recommend that you test your Skymetry WTU-14 weekly to be sure it is functioning properly. This will ensure that when a problem arises the Skymetry WTU-14 will be ready to alert the appropriate personnel. A blank Test Log is included at the back of this manual.

There are several tests to be performed:

1. Request a Status Report from the unit by sending it an e-mail message and verifying the reply. This will test the unit's ability to receive and send a message. It will also verify that all of the inputs are reading properly, the alarm conditions are OK, the electricity is on, and the battery is OK.
2. Create an alarm on each input by tripping all connected sensors. This will verify that each input is being recognized by the unit and that it is programmed properly.

Temperature sensors: Heat or cool the sensor.

Motion sensors: Have someone walk in front of the sensor.

Door and window sensors: Open the door or window.

Water sensors: Apply a small amount of water beneath the sensor or use a wet towel and touch it to the sensor probes.

Humidity sensors: Raise the humidity around the sensor by holding a cup of very hot water beneath it.

4–20mA Transducers: Verify that the WTU-14 is reading the proper level by measuring the monitored quantity using alternative methods.

Allow the unit to send its alarm message to all programmed contacts. This will make sure that the WTU-14 is programmed properly. It will also prepare personnel to respond appropriately when they receive a call from the WTU-14.

3. Test the battery by unplugging the AC adapter and making sure that the WTU-14 continues to function. Check the LEDs to make sure that the Power LED starts to blink and the Battery LED glows steadily. Keep the AC adapter unplugged so that a Power Failure alarm occurs. Allow the unit to send its alarm message to all programmed contacts while running on battery backup. Plug in the AC adapter after the unit has finished sending all of its messages.
4. If you require assistance, contact Phonetics Technical Support at (610) 558-2700.

APPENDIX B: Troubleshooting

I can't communicate with my unit locally.

- Make sure you have entered the proper SkyID.
- Make sure the cable is connected from your computer to the WTU-14.
- Make sure you have the right Com port selected (*typically 1 or 2*).
- Make sure the unit is receiving power.

I can't access my unit on the web page.

- Have you logged in locally to your WTU-14 and changed the password? This is required to initialize the web page.
- Have you entered the proper *SkyID* and *Password*?

Why is the 'IN RANGE' LED off?

- If the unit is not within range of the wireless network the LED will not turn on.
- It typically takes 1-2 minutes from power-up for the WTU-14 to recognize the wireless network and turn on the LED.
- Make sure the unit is receiving power.

Why is the 'REGISTERED' LED off?

- If the IN RANGE LED is lit but the REGISTERED LED is not, then the unit is not activated yet.
- Make sure the unit is receiving power.

Why is the 'BATTERY OK' LED off?

- There is no battery connected.
- The battery voltage is low.

Why is the 'POWER OK' LED off?

- The main power has failed and the unit is running batteries.
- The voltage at the Vin terminals is low.

Why is the 'ALARM' LED blinking?

- There is an unacknowledged alarm.

Why is the 'ALARM' LED on?

- There is an alarm but it has been acknowledged.

Why won't the unit send me alarm messages?

- The WTU-14 will not send any alarm messages if you are connected locally.
- There are no destinations programmed.
- None of the destinations are enabled.
- The unit is not activated on the wireless network
- The destinations are not programmed correctly.
- There are no unacknowledged alarms.

My unit won't make a voice call.

- The telephone number is programmed incorrectly. It should only include the area code and number (e.g., 10 digits). Do not enter a 1 as the first digit.
- The WTU-14 will not send any alarm messages if you are connected locally.

- There are no destinations programmed.
- None of the destinations are enabled.
- The unit is not activated on the wireless network
- There are no unacknowledged alarms.

My unit won't send a text message to my cell phone or alphanumeric pager.

- The Destination is programmed incorrectly. You must use the e-mail address format for your cellular or paging provider as specified in chapter 8.
- The Destination type is set incorrectly. It should be set to *Internet E-mail Address*.
- The WTU-14 will not send any alarm messages if you are connected locally.
- There are no destinations programmed.
- None of the destinations is enabled.
- The unit is not activated on the wireless network
- There are no unacknowledged alarms.

Why does the unit call people even after I acknowledged the alarm?

- When an alarm occurs the unit will begin to sequentially broadcast all alarm messages for the first Tier. Depending on how quickly they get dispatched from the messaging center its possible for additional calls to be made even after the alarm has been acknowledged. Once the message is received at the messaging center it will be called regardless of acknowledgement.

My unit won't execute a Local machine-to-machine command.

- Machine-to-machine commands will not execute while you are connected locally.

- The output you are trying to switch is not set to manual mode.
- The input condition for the machine-to-machine command is not being met.

My unit won't execute a Remote machine-to-machine command.

- Machine-to-machine commands will not execute while you are connected locally.
- The output on the remote unit you are trying to switch is not set to manual mode.
- The input condition for the machine-to-machine command is not being met.
- The *SkyID* and *Password* for the remote unit is programmed incorrectly.

My WTU-14 isn't displaying the correct value from my 4–20mA transducer.

- The analog input jumper isn't set to the 4–20mA position.
- The analog input “type” isn't set to 4–20mA in the software.
- The transducer is not wired correctly.
- The transducer is not calibrated for the desired measurement range.
- The analog input table values aren't programmed to the calibrated range of the transducer.
- The transducer is not compatible with single-ended inputs therefore an isolation device is required.

My temperature sensor isn't displaying the correct value.

- The analog input jumper isn't set to the Temperature position.
- The analog input “type” isn't set to Temperature in the software
- The temperature sensor isn't a compatible 10K thermistor.
- The temperature sensor isn't wired correctly.

Why don't the values displayed on the web page match the values displayed in the Skymetry software?

- The web page displays a snapshot of the values at a particular moment in time. It does not display real-time values, as is the case when connected locally through the Skymetry software.
- Click the *Status Update* button on the web page to retrieve a current snapshot.

Why can't I get pump control to work?

- The Output(s) are not set to *Pump Control* mode.
- The Pump Control parameters are programmed incorrectly.
- The level transducer is not wired to analog input #6.
- The level transducer is not reading the proper values.
- The float switches are not wired to Dry Contact inputs #6, #7, and #8.
- The float switches are not *Normally Open*.
- The *Lead*, *Lag*, and *Pumps-Off* float switches are not wired to the proper inputs.

APPENDIX C: Thermistor Table

10K Thermistor Data

Degrees Celsius	Resistance (Ohms)
-30	135.2K
-20	78.91K
-10	47.54
0	29.49K
10	18.79K
20	12.25K
30	8,194
40	5,592
50	3,893
60	2,760
70	1,990

APPENDIX D: SKYMETRY WTU-14 Specifications

ENVIRONMENTAL INPUTS

Number of Dry Contact Inputs: 8

Dry Contact Input Types: N.O./N.C. contact, pulse count, equipment run time

Dry Contact Input Electrical Characteristics: 47K Ω to 5V

Number of Analog Inputs: 6

Analog Input Types: 10K thermistor (-60° to 175° F) and 4–20mA (-10,000 to 10,000)

Analog Input Electrical Characteristics: 22K Ω to 2.5V (temperature) and 250 Ohms to ground (4–20mA)

Input Connector: terminal block

A/D Converter Resolution: 10 bits ± 2 LSB

Input Protection: Metal Oxide Varistors and fast acting diode clamps

RELAY OUTPUTS

Number of Relay Outputs: 2

Rating: 0.3A 120VAC / 1.0A 24VDC Maximum

Type: SPDT Form-C Latching

Relay Output Connector: terminal block

LED INDICATORS

Function: Alarm, Radio Registered, Radio In Range, Battery OK, Power OK, Output #1, Output #2

POWER SUPPLY

Power Supply: 15VDC 800mA power transformer

Power Consumption: 50mA typical, 700mA burst (radio transmit)

Power Protection: Metal Oxide Varistor

Battery Backup/Charger: Compatible with 12V sealed gel-cell,
2.2AH (36hrs) – 12AH (200 hrs)

ENVIRONMENTAL

Operating Temperature: -20° to 158°F (-29° to 70°C)

Operating Humidity: 0 to 90% RH non-condensing

Storage Temperature: -20° to 158°F (-29° to 70°C)

PHYSICAL: Skymetry Unit

Dimensions: 8.0"h x 6.1"w x 1.6"d

Weight: 1.2 lbs.

Enclosure: Aluminum housing w/mounting brackets

PHYSICAL: Skymetry Unit in NEMA-4 enclosure

Dimensions: 12"h x 8"w x 6"d

Weight: 8 lbs.

Specifications subject to change without notice.

APPENDIX E: Replacing the Backup Battery

(NEMA-4 enclosure models only)

The back-up battery will provide about 4–5 years of service life depending on usage and temperature. After 5 years (or when backup time is insufficient) the battery should be replaced. Replacement batteries can be ordered from Phonetics. To replace the battery, follow the instructions below:

1. Disconnect the red battery wire and cover the bare wire with insulating electrical tape.
2. Disconnect the black battery wire and cover the bare wire with insulating electrical tape.
3. Unplug the power transformer.
4. Loosen the compression wiring connectors and allow 6-10" of cable slack to come into the enclosure. This will make it easier to turn the panel over.
5. Remove the four screws securing the Skymetry housing to the back panel and carefully remove the Skymetry WTU-14.
6. Remove the connectors from the battery by carefully pulling and wiggling the connectors from the battery tabs.
7. Remove the screws holding the battery bracket and remove the bracket.
8. Dispose of/recycle the old battery following local recycling regulations for lead batteries.
9. Insert the new replacement battery into the slot and replace the bracket. Secure the bracket with the two screws.
10. Attach the battery connector at the end of the BLACK wire to the -(negative) terminal of the new battery.
11. Attach the battery connector at the end of the RED wire to the +(positive) terminal of the new battery.

12. Place the WTU-14 over the four metal stand-offs and re-attach the four screws.
13. Readjust the cables through the compression connectors and secure the fittings.
14. Plug the power transformer into the outlet.
15. Connect the Black battery wire to the “BAT -” terminal.
16. Connect the Red battery wire to the “BAT +” terminal.

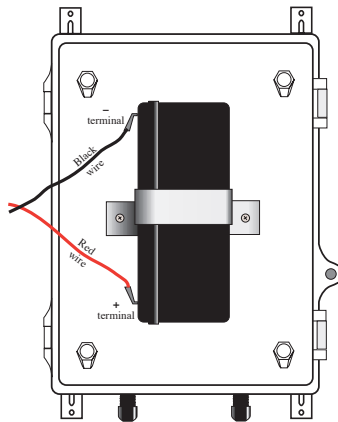


Figure 1: Battery placement

APPENDIX F: Optional Accessories

The sensors and accessories listed below are available from Phonetics, Inc., and represent the most commonly used devices. Other dry contact sensors or 4–20mA transducers, designed for more specialized applications, may also be used. Commercial or industrial electrical supply houses can provide devices to monitor virtually any condition. For further information, contact a Phonetics Sales Associate toll-free at 1-877-373-2700.

PART NUMBER	PART/ DESCRIPTION
FGD-0006	Magnetic Reed Switch
FGD-0007	Passive Infra-Red Detector
FGD-0010	50' 2-conductor #22AWG shielded accessory Cable
FGD-0013	Spot Water Detector
FGD-0022	Temp° Alert
FGD-0023	ISOTEL Surge Protector
FGD-0027	Humidistat
FGD-0049	Smoke Detector with Built-in Relay
FGD-0052	Humidity Transmitter
FGD-0054	Power-Out Alert™
FGD-0056	Zone Water Detector w/Water Rope
FGD-0063	10' additional Water Rope for FGD-0056
FGD-0102	10K Weatherproof Temperature Probe
FGD-0104	10K Outdoor Air Weatherproof Temperature Sensor
FGD-0205	Multipoint Wireless I/O System
FGD-8250	15VDC Plug-in Power Supply
FGD-8251	Replacement Unity Gain Stub Antenna
FGD-8252	1' RG142 Antenna cable w/bulkhead connector
FGD-8253	3' RG142 Antenna cable w/bulkhead connector
FGD-8254	80 Hour 12V Battery Kit—panel mount
FGD-0061	Tipping-Bucket Rain Gauge
FGD-0062	Solar Kit: Solar Panel, Mounting Bracket, Charger, 200 hour Battery, Battery Enclosure, & Cables

APPENDIX G: Returning Your Skymetry WTU-14 for Repair

In the event that the Skymetry WTU-14 does not function properly, we suggest that you do the following:

1. Record your observations regarding the WTU-14's malfunction.
2. Call Phonetics Technical Support toll-free at 1-877-373-2700 or e-mail support@sensaphone.com prior to sending the unit to Phonetics for repair. Our product support specialists are able to diagnose and correct many unit setup and programming problems over the phone.

If the unit must be sent to Phonetics for servicing, please do the following:

1. Unplug the power supply, disconnect the battery, and disconnect all wiring.
2. Carefully pack the unit to avoid damage in transit. Use the original container (if available) or a sturdy shipping box.
3. To avoid shipping delays, you must include the following information:
 - a) Your name, address and telephone number.
 - b) A note explaining the problem.

4. Ship your package to the address below:

SERVICE DEPARTMENT

Phonetics, Inc.

901 Tryens Road

Aston, PA 19014

5. Ship prepaid and insured via UPS or US Mail to ensure a traceable shipment with recourse for damage or replacement.

Test Log

Date	Inputs		Dialout		Call-In		Battery				Tested By
	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
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Index

10K Thermistor Data 99

A

Alarm Acknowledgment 78–80 (*See also* Operation: Alarm Notification & Acknowledgement)

Alarm Notification 65–74 (*See also* Operation: Alarm Notification & Acknowledgement)

Acknowledgment via E-mail or Text Message 74

Additional Information 74

Alphanumeric Pager 69–71

Paging Providers & Address formats 70–71

How it works 65

Internet E-Mail 67

Text Messaging to Cell Phones 71–74

Cellular Providers & Formats 73–74

Voice Phone Call 66–68

Alarm Programming 40–46 (*See also* Input Programming)

I

Input Programming

Alarm States 39

Analog Inputs 43–46

Programming 44

Alarm Enable/Disable 45

Alarm on Return-to-Normal 46

Alarm Recognition Time 46

Alarm Reset Time 46

Battery Input 47

Calibration 45

Configuring Input Name 44

Configuring the Input Type 45

Enable/Disable 45

Input Enable/Disable 45

Power Input 46

Setting Alarm Limits 46

Table Limits 45

Dry Contact Inputs 40–43

Programming 41

- Alarm Enable/Disable 43
- Alarm on Return-to-Normal 43
- Alarm Recognition Time 43
- Alarm Reset Time 43
- Configuring Pulse Counter 42
- Configuring Run Time 42
- Configuring the Input Name 42
- Configuring Type 42
- Input Enable/Disable 42
- Special Function Inputs 47
- Introduction
 - Data Message Usage 18–19
 - Overview 18
 - Technical Support 19
 - Web Page Initialization. *See* Skymetry Web Page
 - Web Page Initialization 18

M

- Machine-to-Machine Control 59–64
 - Important Information and Warnings 61
 - Local Output Control 60
 - Sample Application 61–63

O

- Operation 75–82
 - Alarm Notification and Acknowledgment 75–80
 - Alarm Acknowledgment 78–80
 - Alphanumeric Pager 79
 - Automatic 80
 - Text Message to Cell Phone 79
 - Voice Notification 78–79
 - Alarm Notification 75
 - Alphanumeric Pager 77
 - E-mail 76
 - Text Message to Cell Phone 77
 - Voice 76
 - Alarm Recognition 75
 - Dialout Note: Call Progress 75
 - Tier Delay 77–78
 - Status Request 81–82
- Output Programming
 - Configuring the Output Operating Mode 50
 - Output Status & Statistics 51

Setting the Output Name 50

Switching the Output 51

P

Pump Control

How it works

Analog Level Sensor 55

Float Switches 53

Installation Recommendations 55

Output Wiring 57

Programming for Pump Control 55–57

R

Replacing the Backup Battery 103–104. *See also* Installation: Connecting a Battery

S

Skymetry

Accessories 105–106

Installation

Activating Skymetry 21, 27

Connecting a Battery 26

Grounding 27–28

Connecting the Power Supply 25

LED Indicators 34

Mounting the Skymetry WTU-14

Aluminum Housing 21

Antenna Information 25

NEMA-4X Housing 23

Operating Environment 21

Wiring Recommendations 33

Wiring Sensors to Analog Inputs 31

Wiring Sensors to Dry Contact Inputs 28

Normally Open Sensors 30

Repair Instructions 107–108

Test Log 109–110. *See also* Testing the Skymetry WTU-14

Skymetry Web Page 83–86

Account Usage 85

Alarm History 85

Programming Refresh 84

Programming via the Web Page 84

Status Refresh 83

Switching Outputs via the Web page 84

Software

Activating your Skymetry WTU-14 36

Installing and Starting 35

Skymetry WTU-14 Web Page 38. *See also* Skymetry Web Page

T

Testing the Skymetry WTU-14 87–89

Control Programming 88–89

Input Testing 87–88

Notification Testing 87

Output Testing 88

Pump Control 89

W

WARRANTY vi